A Water Protection Strategy for

MONTANA

Missouri River Basin

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION
Water Resources Division
September, 1982

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WATER RESOURCES DIVISION

A WATER PROTECTION STRATEGY

FOR MONTANA

- MISSOURI RIVER BASIN-

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ACKNOWLEDGMENTS

The Department gratefully acknowledges the Montana Historical Society for its assistance in preparing copies of the drawings used in the report. The sketches highlight several features of the Missouri River observed during expeditions to Montana in the mid-1800's. The cover sketch by Gustave Sohon is from "Explorations and Surveys for a Railroad Route from the Mississippi River to the Pacific Ocean," Vol. XII, Book 1 (Washington, Thomas H. Ford, 1860). All other drawings are from "Pencil Sketches of Montana," (New York, A.E. Mathews, 1868).

FOREWORD

This study was undertaken by the Department of Natural Resources and Conservation in response to a directive by the 47th Session of the Montana legislature (House Bill 709). That legislation appropriated funds to the Department for a study to "...develop a strategy to protect Montana's water from downstream uses and insure water availability for Montana's future needs...." The study is to provide the Montana legislative and executive branches with background information, a problem analysis, and recommendations on Montana's major water question: How to protect Montana's water for current and future instate use from downstream commitments? The document serves as a basis for water policy, planning, and implementation decisions.

A strategy committee of the Department of Natural Resources and Conservation provided the direction, scope, critique, contribution of strategies, and final editing for this study. The individuals involved include:

Gerhard Knudsen	Supervisor, Water Planning Section
Richard Moy	Chief, Water Management Bureau
Jack Acord	Asst. Administrator, Water Resources Division
Richard Brasch	Program Manager, Water Engineering Bureau
David Ladd	Attorney (former employee, Compact Commission Section)

Gary Fritz, Administrator, Water Resources Division, provided valuable direction to this committee, assisting it in performing the assigned duties and carrying out the objectives of the study.

Other DNRC staff who provided technical assistance and participated in the critical review include:

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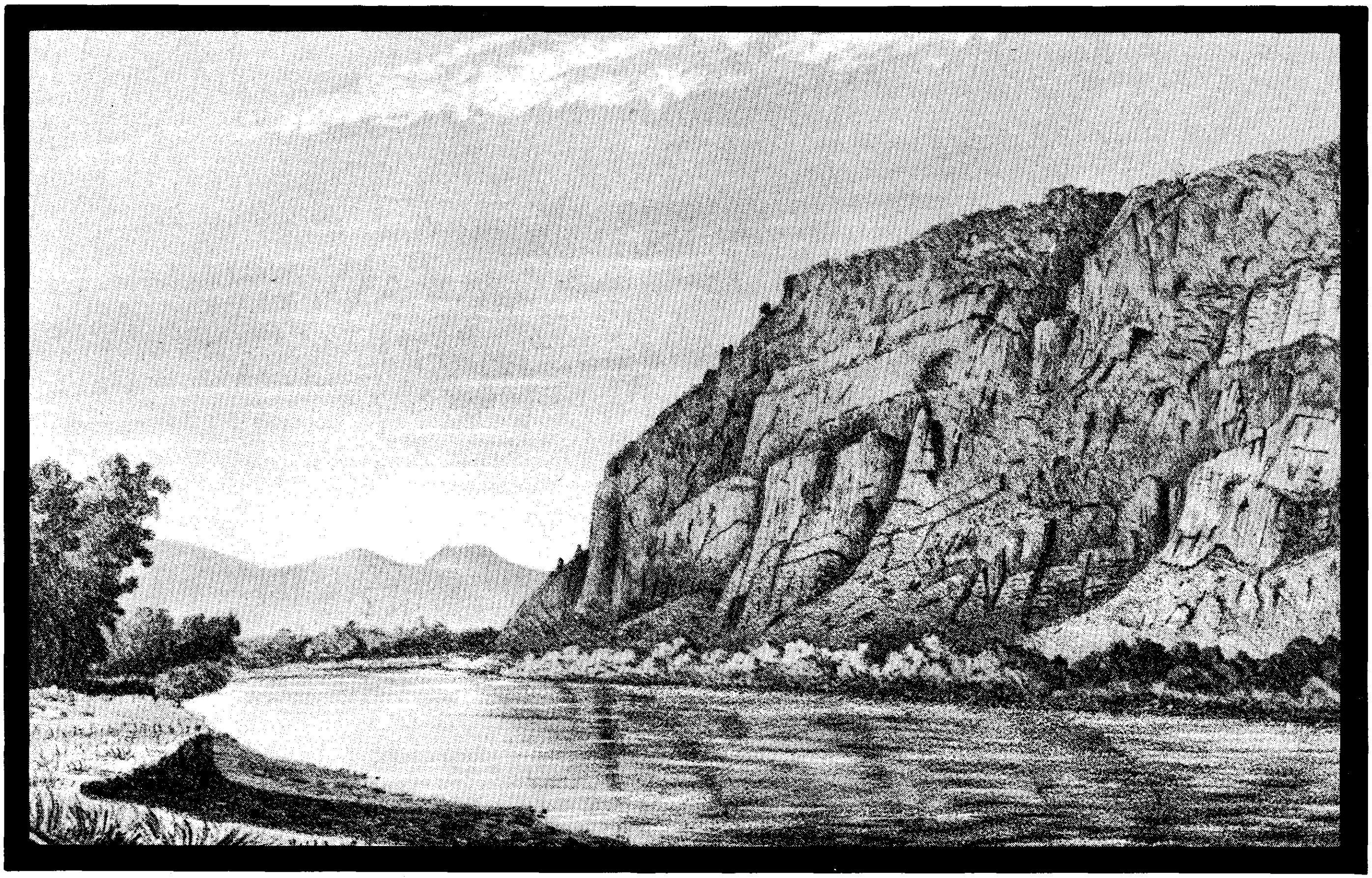

A. E. Mathews — 1867 HEADWATERS OF THE MISSOURI

CHAPTER I

Introduction

CHAPTER I - INTRODUCTION

STUDY DIRECTIVE

The 1981 Montana Legislature directed the Department of Natural Resources and Conservation (DNRC) to develop a strategy to protect Montana's options for future instate water use in the face of expanding water use by downstream states. There is a concern about the limitations that downstream, out-of-state water development could impose upon future consumptive water use in Montana. A feeling prevalent in Montana is that water flowing out of the state will be claimed by downstream states whose use of water is expanding more rapidly than Montana's. There is a fear that Montana may at some time in the future be obligated to curtail expansion of its consumptive water use because increased depletion in Montana could limit the water available to prior rights or established uses downstream. It is also feared that, given the political power of lower basin states, Montana could find it difficult to defend its claimed right to future use of instate water in a national political arena. To compensate for these possible inequities, many Montanans feel the state must anticipate how best to prepare for any interstate water conflict which could arise.

The Potential for Downstream Constraints on Use of Montana Waters

Serious interstate water use conflicts that could constrain future Montana water uses can involve both instream uses and withdrawals. In stream water uses that have been or are being established downstream from Montana include hydroelectric power generation, navigation, water quality enhancement, recreation, and the maintenance of fisheries. Such instream uses have been established on both the Columbia River system downstream from Montana and on the Missouri River through the construction of large reservoirs, hydroelectric power plants, and regulation of streamflows for the other instream uses.

Diversionary water uses, most involving consumptive water use, include irrigation, municipal, industrial, and energy water uses. There is a possibility for development of large quantities of new consumptive uses in both the Columbia River and Missouri River basins. In addition, interbasin water transfers from the Columbia or Missouri River basins could also increase the competition for water.

The potential for conflicts exists in many ways. Political opposition has been expressed to upstream water depletive uses which will have the real or perceived effect of reducing water currently used for hydroelectric power generation or navigation, even though the authorization documents for these uses allow for future expansion of upstream water depletions. Competition for water within downstream states, between those who wish to expand consumptive uses and those who want to maintain or expand instream uses, can result in a combined effort to curtail

further upstream water depletion in order to maintain the downstream water supply.

Conflicts can result in lawsuits seeking to enjoin the proposed upstream water use expansions. Downstream states can join political forces to stop federal appropriations for upstream water projects, to deauthorize federal projects, or to enact environmental or other constraints to upstream development.

The timing of new water uses can help create conflicts. A slow rate of upstream water development has allowed water to remain in the river for enough time for downstream uses to become established. Thus, the downstream states become accustomed to water that would not have been available under a more rapid rate of upstream development, and these downstream states may seek to insure the continuance of the river flows.

Allocation of water uses among the states in a river basin is a primary way to insure water availability without interstate conflict. The pertinent questions are: what is the potential for conflict, when will it occur, how will it occur, and how should it be avoided?

STUDY OBJECTIVES

The Water Resources Division of the Montana DNRC set forth ambitious objectives for this report, which presents the options for future interstate water allocation. Briefly stated, these include:

1. Present a brief background of Montana's water resources, existing and prospective uses, and legal/institutional framework.

2. Identify downstream states' water uses, water controls, prospective uses, and legal/institutional framework.

3. Assess the potential for conflicts between Montana and downstream water uses and vice versa.

4. Estimate the potential economic impact of water use conflicts to Montana and to the downstream states.

5. Summarize the methods of interstate water allocation and their advantages and disadvantages.

6. Evaluate methods Montana could pursue to achieve interstate water allocation.

7. Present and evaluate strategies for preserving Montana's options for water development.

THE SETTING

Background

The State of Montana contains 147,000 square miles, of which 25,400 square miles are in the Columbia River Basin, 600 square miles are tributary to Hudson Bay, and 121,000 square miles are in the Missouri River Basin. Figure I-1 shows the major drainage basins of Montana and the approximate grouping of counties into those portions of the state in the Columbia River Basin (Kootenai and Clark Fork basins) and in the Upper Missouri and Yellowstone River basins, which are the headwaters of the Missouri River.

The principal land uses in the State of Montana are agricultural, including forests, rangeland, and cropland. Other land uses include recreational and parks, municipal, industrial, mining, military, and transportation.

The U.S. census for Montana indicates a 1980 population of 786,690. This is an increase of 13.2 percent over the 1970 population of 694,409. About 33 percent of the total population, or 259,901 people, live west of the Continental Divide in the Montana portion of the Columbia River Basin. The largest population, 318,654 persons (40.5 percent), reside in the Missouri River Basin portion of the state, and about 26.5 percent, or 208,135 persons, live in the Yellowstone River Basin.

Streamflow records indicate that the average outflow of water from Montana is about 43,895,600 acre-feet per year. Of that amount, about 59.3 percent (26,040,000 acre-feet per year) flows into the Columbia River west of the Continental Divide. Another 2.3 percent (989,200 acre-feet per year) flows into the Hudson Bay. The remaining 16,866,000 acre-feet per year, or 38.4 percent, flow downstream into the Missouri River system. It is interesting to note that in western Montana 17.3 percent of the land area produces 60.7 percent of the river outflow from Montana. This reflects the tremendous water collection in the western Montana mountains in the form of snow pack. It is the melting of this snow pack in the springtime that creates the largest rates of flow in the major rivers in Montana.

Legal/Institutional Framework

Montana Water Law. Montana's past and current water laws are based upon the appropriation doctrine. Under this doctrine, "beneficial use" of water is the basis, the measure, and the limit of a water right. The Montana Water Use Act of 1973 defines beneficial uses as including, but not limited to, agriculture (including stock water), domestic, fish and wildlife, industry, irrigation, mining, municipal, power, and recreation.

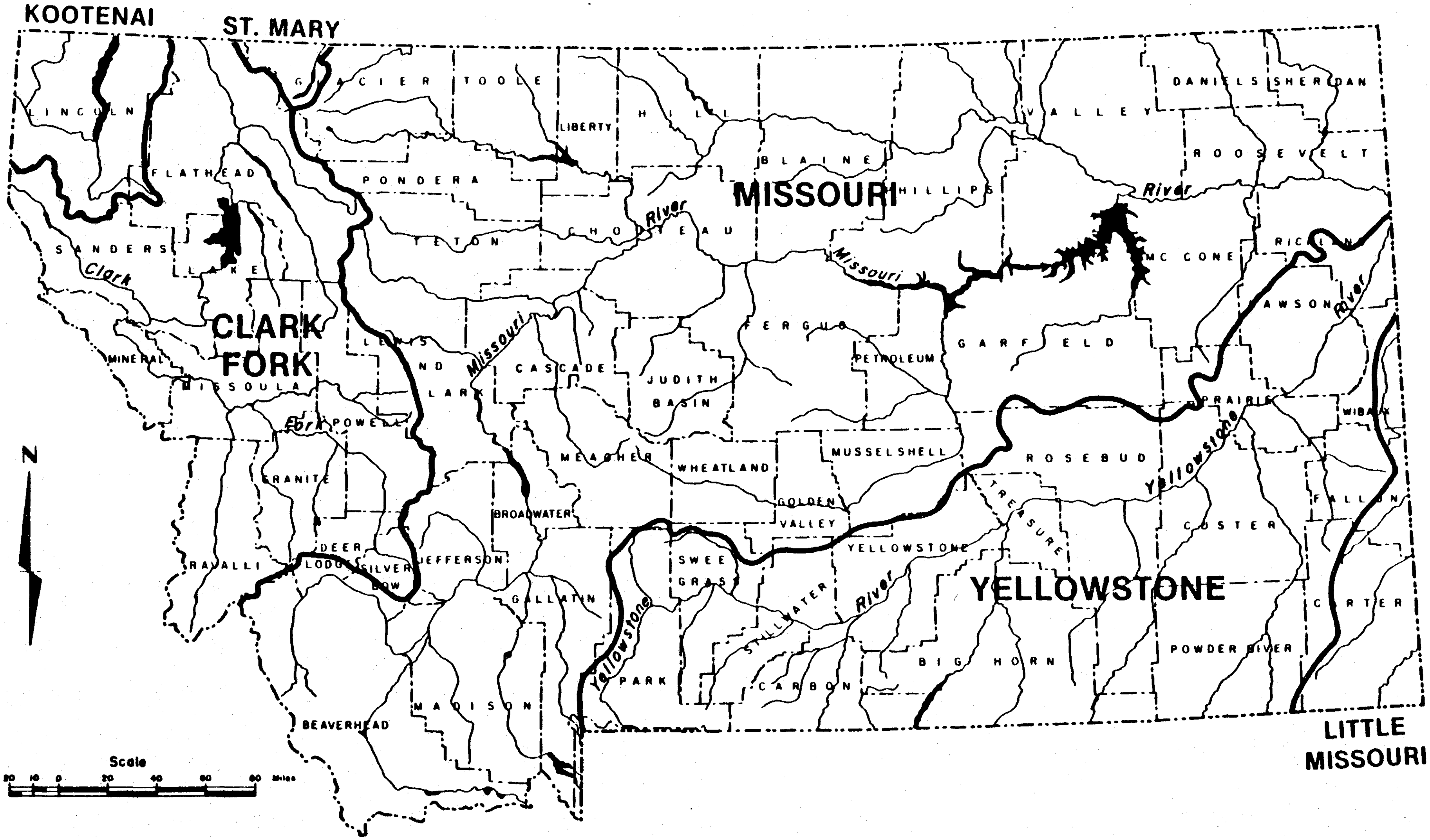

FIGURE I-1 DRAINAGE BASIN BOUNDARIES, STATE OF MONTANA

A water right carries with it a priority date which is usually the date that the first act is done to initiate the right. An appropriation having a prior right in time has precedence over water rights with a later priority date. In other words, "first in time is first in right."

Appropriations of water under the appropriation doctrine are normally for a definite rate of direct flow diversion or an amount of storage. The key factor is that amount of water actually needed for the specified beneficial use. Once acquired and perfected, water rights are property rights, and they become appurtenant to the lands upon which the water is used. Like other property rights, they may be sold or transferred, retaining their original priority date.

The Water Resources Act of 1967 was the first legislation in Montana aimed specifically at developing a comprehensive water plan for Montana. The Water Resources Division of DNRC is responsible for developing the plan and for coordinating local, state, and federal water resource plans and projects. The State Water Plan is mandated to be a coordinated, multiple use resource plan designed to insure optimal beneficial use and conservation of Montana's water resources.

The first phase of the State Water Plan is an inventory of the state's water resources, about which many reports have been published. Some of the published and unpublished data have been computerized for subsequent phases.

The second phase of the Plan involves development of projections of future water and related land resources use. Projections must be periodically updated, and more detailed projections must be developed for specific planning.

Phase three involves the development and publication of alternative plans, programs, and projects to be implemented by the year 2020. Selection of development projects is determined from the findings of the first two phases of the Plan and the findings of other state, local, or federal planning efforts.

The fourth phase of the State Water Plan is the implementation of recommended plans, programs, and projects. Some implementation takes place with the present planning efforts, and much implementation will be the result of future detailed surveys of problem areas. The Flathead River Basin Level B studies completed in 1976 have been adopted, and implementation of the recommended programs and projects will be pursued by DNRC.

The 1973 Montana Water Use Act (Title 85, Chapter 2, Parts 1-4 MCA) added a mandatory administrative procedure to the method of acquiring and utilizing water rights. Prior to the Water Use Act, a water user in Montana could acquire a water right by simply appropriating the water and putting it to beneficial use. No statutory procedure was necessary, and consequently, there are literally tens of thousands of valid water rights ("use rights") in Montana which are not recorded.

The Water Use Act also established a permit system for water rights administration. After July 1, 1973, no one could acquire a new right to groundwater (over 100 gallons per minute) or surface water without first applying for and receiving a permit from the Department of Natural Resources and Conservation. The Department must grant a permit if the the following conditions are met: 1) the proposed appropriation will not adversely affect prior rights, 2) unappropriated waters are available from the source of supply, 3) the means of diversion or construction are adequate, 4) the proposed use is a beneficial use, and 5) the proposed use will not interfere unreasonably with other planned uses or developments for which a permit has been issued or for which water has been reserved.

In addition to the new permit system, the Water Use Act also prescribes procedures for transferring or changing water rights, for adjudicating all existing rights through the state district courts, and for establishing reservations of water for future use or to preserve minimum instream flows.

The Yellowstone Moratorium (Title 85, Chapter 2, Part 6, MCA) was enacted by the Montana legislature in 1974. The moratorium suspended actions on all applications for permits to appropriate water for more than 20 cubic feet per second (cfs) or 14,000 acre-feet in the Yellowstone River Basin until the reservation applications were acted upon. Under this reservation procedure provided by the Water Use Act, municipalities, conservation districts, state agencies, and the federal government have reserved large quantities of Yellowstone River water for municipal water supplies, irrigation, and instream flows, plus some multipurpose storage. Uses under these reservations, when made, will take precedence over other appropriations subsequently granted.

An appropriator of more than 15 cfs may not change the use of an appropriation right from an agricultural use to an industrial use; however, the Department has administrative discretion to approve changes to agricultural, irrigation, domestic, and municipal water uses under certain conditions.

In 1921 the legislature prohibited the diversion of Montana's water across the state line without legislative approval (Section 85-1-121,

MCA). The Water Use Act specifically declares that the use of water for the slurry transport of coal is not a beneficial use. Thus, slurry pipelines are prohibited.

Prior to the Water Use Act, a statute (Section 89-801 et. seq. RCM 1947) enacted in 1969 made unappropriated waters subject to appropriation by the Montana Fish and Game Commission "in such amounts only as may be necessary to maintain stream flows necessary for the preservation of fish and wildlife habitat." These appropriations, known as Murphy rights in honor of the author of the bill, were to have priority over other uses "until the district court...shall determine that such waters are needed for a use...more beneficial to the public." However, the Murphy rights for instream flow will not affect prior rights, because this section was repealed by the Water Use Act. While the appropriations made under this provision are recognized water rights, they may be subject to interpretation and quantification.

Federal Laws. The power of the United States to regulate and control water resources stems from several sources, including the commerce clause of the Constitution. Congress may enact laws regulating commerce on navigable streams, including storage of water for navigation releases, flood control, and incidental power generation. The definition of a navigable stream has been the subject of much litigation, but it is generally accepted that "navigable" has a broad meaning even extending to tributaries of navigable streams. These larger regional projects for navigation, flood control, and power need not comply with state laws.

Congress has also authorized the Department of Interior through the Bureau of Reclamation to construct projects for power, municipal, and irrigation purposes. The Yellowtail Dam on the Bighorn River is an example in eastern Montana. The Bureau of Reclamation must comply with state water laws by obtaining a state permit for the construction of such projects.

In California v. United States (438 U.S. 635, 1978), the Supreme Court held that the Bureau, absent a contrary federal directive in the authorizing legislation, must follow state laws when appropriating, condemning, or purchasing water rights for federal projects, and that, once the waters were released, their distribution to individual landowners will again be controlled by state laws.

The federal government also possesses what are termed "reserved rights" to water (not to be confused with reservation of water under Montana's new Water Use Act) which are not subject to state law. Under the famous Winters decision (Winters v. United States, 207 U.S. 564, 1908) and subsequent decisions, the courts have held that when the United States reserves lands from the public domain, a water right is also re-

served for a sufficient quantity of water necessary for the purposes of the reserved land. The reserved water right has a priority date that is the date of the creation of the reservation, and it does not depend upon immediate beneficial use as do other appropriation rights. Consequently, there are now reserved water rights on all federal lands withdrawn from the public domain, including Indian reservations and most national forests. The extent of such rights is largely unknown at present, though a recent Supreme Court decision (United States v. New Mexico, No. 77-510, July 3, 1978) ruled that a reservation of water for federally reserved lands is in the amount necessary for the primary purpose of the reservation only.

The federal reserved water right remains largely unquantified. Because of the uncertainty of the federal reserved rights, considerable controversy concerning their status has arisen in the past. Indian water rights are based upon the reserved rights of federal reservations and the Winters Doctrine that arose in 1908.

Where water is necessary for a secondary use of a reservation, or where water for beneficial use is needed for other federal purposes not on reserved lands, the United States must acquire water in the same manner as any other public or private appropriator in the state.

Methods of Interstate Water Allocation. There are three primary means of interstate water allocations - interstate stream compacts, equitable apportionment, and congressional apportionment.

Interstate stream compacts are agreements to allocate the interstate waters among the affected states. The authority to negotiate a compact is granted by Congress. Interstate stream compacts must be ratified by the legislature of each involved state and consented to by Congress. In two eastern compacts the United States is a party to the agreement, and a joint federal/state agency is given planning and regulatory authority.

The Yellowstone River Compact, executed by Montana, Wyoming, and North Dakota, and ratified by the United States Congress in 1950, was designed to allocate water of the Clarks Fork of the Yellowstone, Bighorn, Tongue, and Powder rivers. The Compact recognizes water rights prior to 1950, those rights designated to provide supplemental water supplies to land irrigated prior to 1950, and water rights for irrigation projects started before 1950. The Compact divides the remaining water according to percentages of the flow at the mouths of the streams as shown in Table I-1; existing stock and domestic uses are excluded from the allocation limits.

Article X of the compact prohibits diversion of water out of the Yellowstone Basin without the unanimous consent of the signatory states.

TABLE I-1 DIVISION OF WATERS UNDER THE YELLOWSTONE RIVER COMPACT

Tributary	Wyoming	Montana
Clarks Fork Yellowstone	60%	40%
Bighorn	80%	20%
Tongue	40%	60%
Powder	42%	58%

Source: Yellowstone River Compact

The Attorneys General of the three states have agreed it is up to the legislature to decide how consent will be given. North Dakota's legislature has delegated approval to its State Water Commission. In Montana, legislation gives approval authority to the Board of Natural Resources and Conservation subject to ratification by the legislature. After July 1, 1983, the Board alone has the authority. The Wyoming Legislature has yet to consider Article X approval mechanisms.

Montana's position on diversion of water from the basin is to withhold approval until Montana and Wyoming can agree on quantification of the pre-1950 rights and the remaining flows. Wyoming has published its estimates of the quantities given in Table I-2. Montana does not necessarily agree with the quantification and intends to independently calculate its compact share.

The second method, equitable apportionment of interstate waters, results from a lawsuit in an appropriate court. Such a lawsuit is usually brought by the state, under the doctrine of parens patriae, as representative of all its citizens. The primary principle for making the apportionment has been protection of existing rights, although priority of appropriation has not always been strictly applied. The interstate lawsuit has usually been brought to divide the waters of over-appropriated streams, but unappropriated water may be allocated when claims exceed the supply and development is stymied. The portion of water allocated to the state under such a proceeding will then be allocated intrastate to the state's citizens, under the state water law. Each citizen of a party state is bound by the decree of the court in the interstate action, and the sum of water rights in each state may not be in excess of that allocated to that state.

The third method of interstate allocation is apportionment by Congress. The congressional apportionment on the Colorado River provides a precedent upon which to consider the means of achieving an allocation of waters for Montana from its interstate streams. In the decision of Arizona v. California (373 U.S. 546, 1963), the Court ruled that the Boulder Canyon Project Act passed by Congress allocated the waters of the Lower Colorado River among the states. Section 5 of the Act authorized the Secretary of the Interior to enter into contracts for the storage and delivery of water to the users in the three states involved. Such contracts were a prerequisite to receiving waters from the project. The secretary allocated the water among California, Arizona, and Nevada, taking into account the California Water Limitation Act in which the California legislature agreed to limit its use of Colorado River water to 4.4 million acre-feet per year.

It is somewhat unclear whether the power of Congress to allocate interstate waters is limited to navigable waters. It is probable that it

TABLE I-2 WYOMING'S YELLOWSTONE RIVER COMPACT ESTIMATES (ACRE-FEET PER YEAR)

	Wyoming	Montana
Clarks Fork Yellowstone	429,000	285,000
Bighorn	1,800,000	400,000
Tongue	96,400	144,700
Powder	120,700	166,600
TOTAL	2,446,100	966,300

Source: Wyoming State Engineer's Office 1973

is not. The navigation power has been found to extend upstream to nonnavigable tributaries. In addition, congressional apportionment on nonnavigable waters may be justified under the Property Clause, which states: "The Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property of the United States." The property clause has been found by the U.S. Supreme Court to be sufficient to override the objections of state officials and inconsistent state law.

WATER RESOURCES AND POTENTIAL CONFLICTS

West of the Continental Divide

Water Resources. The Kootenai and Clark Fork rivers flow from Montana downstream into the Columbia River. After leaving Montana, the Clark Fork flows into the Pend Oreille before joining the Columbia River. The principal tributaries of the Clark Fork in Montana are the Bitterroot River, Blackfoot River, and the Flathead River. Figure I-2 shows the Columbia River Basin.

Table I-3 presents a summary of the Montana Columbia River average annual streamflows under present use conditions. A total of about 8.3 million acre-feet of water flow into Montana from Canada each year, and about 17.7 million acre-feet per year of water over and above human consumptive uses originate in this region of Montana. The average quantity of water flowing from Montana at the Montana-Idaho state line is about 26 million acre-feet per year, of which about 10.1 million acre-feet flow in the Kootenai River and about 15.9 million acre-feet per year flow in the Clark Fork.

The Montana water production is an important part of the flow of the Upper Columbia River, although the water contribution from Montana's portion of the total basin becomes a less significant portion of the Columbia River streamflows as the stream travels further downstream. Table I-4 illustrates the percentage of Montana's water contribution and the percentage of the Montana-Idaho state line flows of the total flow at various points on the Columbia River. For example, just downstream of the Clark Fork, the Columbia flow is 44,000 cfs, and the flow of the Clark Fork and Kootenai rivers at the Idaho border is 36,030 cfs, or 81 percent of the flow of the Columbia River at that point. The Montana water yield of about 17.7 million acre-feet (24,540 cfs) is 57 percent of the streamflow in the Columbia River. The Montana contribution is about 11 percent of the average annual streamflow at the mouth of the Columbia.

Nonconsumptive Water Uses. On the Kootenai River, the potential new water uses identified are all associated with the production of electric-

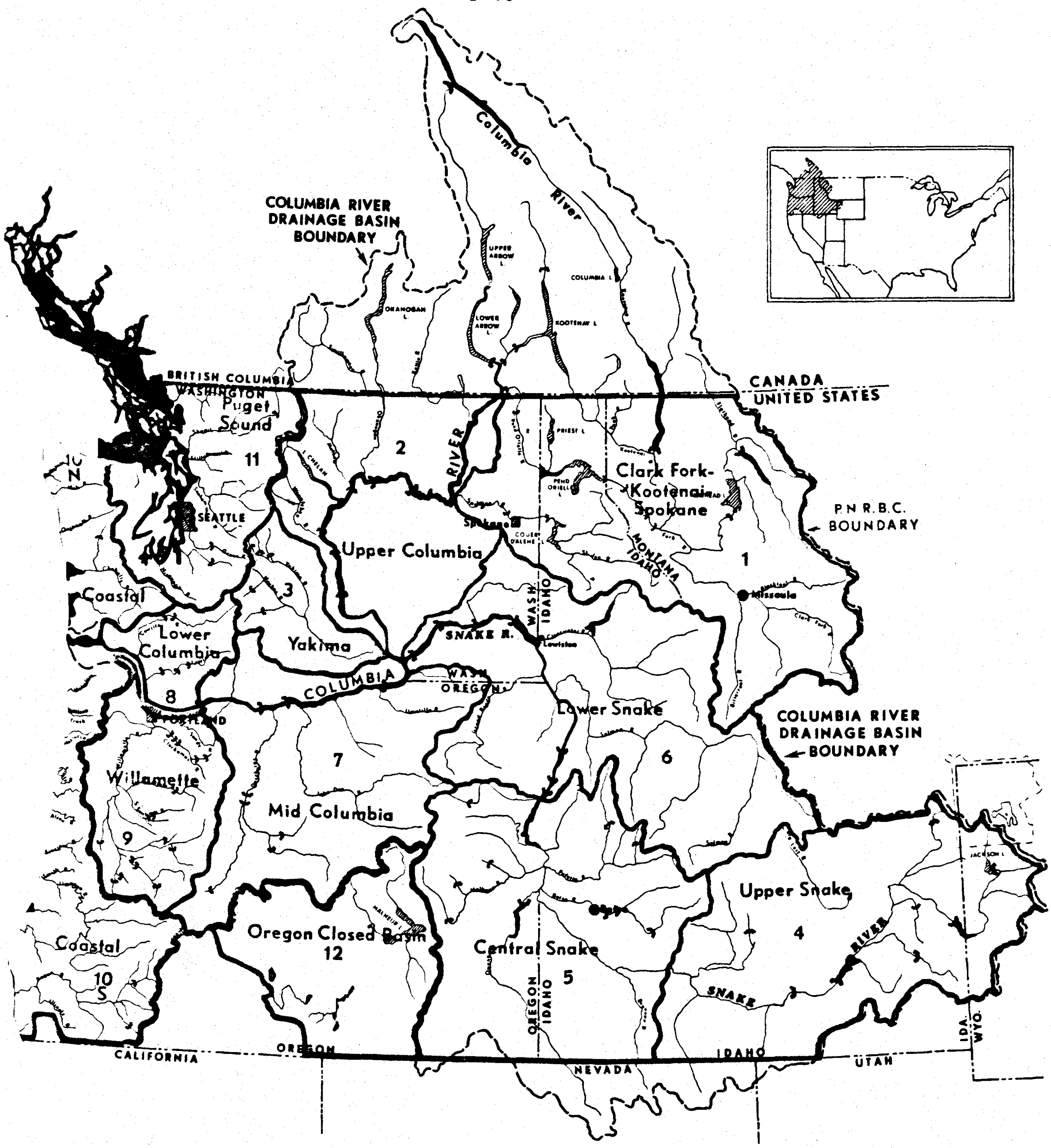

FIGURE I-2 COLUMBIA RIVER BASIN

Source: Pacific Northwest River Basins Commission

TABLE I-3 MONTANA COLUMBIA RIVER AVERAGE ANNUAL STREAMFLOWS UNDER PRESENT USE CONDITIONS (ACRE-FEET PER YEAR)

Average Discharge from Canada	
Kootenai River Basin	7,600,000
Clark Fork Basin	703,500
Subtotal (1)	8,303,500
Average Flow Originating in Montana	
Kootenai River Basin	2,520,000
Clark Fork Basin	15,216,500
Subtotal (2)	17,736,500[2]
Average Montana-Idaho State Line Flows	
Kootenai River Basin	10,120,000
Clark Fork Basin	15,920,000
Total (3) = (1) + (2)	26,040,000[3]

[1] Annual volumes after human use depletions.
[2] Average rate of flow = 24,420 cfs (cubic feet per second)
[3] Average rate of flow = 36,030 cfs

Source: Pacific Northwest River Basins Commission (PNWRBC), June, 1979, Water Today and Tomorrow, Volume III, The States.

TABLE I-4 MONTANA WATER PRODUCTION AND STATE LINE STREAMFLOWS AS PERCENTAGE OF COLUMBIA RIVER STREAMFLOWS

Point on the Columbia River Downstream of:	Columbia River Flow, cfs[1]	Montana Contribution (%)[2]	Montana Outflow (%)[3]
Clark Fork	44,000	57	81
Spokane River	110,000	23	33
Snake River	164,000	15	22
Bonneville Dam	177,000	14	20
At the Mouth	235,000	11	15

1 Average flow, cfs.

2 Average depleted flow origination in Montana, 24,540 cfs.

3 Average flow at Idaho border, 36,030 cfs.

Source: Pacific Northwest River Basins Commission, June 1979, Water Today and Tomorrow, Vol. II, The Region.

ity megawatts. The Libby hydroelectric plant is being proposed for an expansion to 840 megawatts (mw). Downstream potentials include a 75 mw plant at the proposed Libby Reregulating Dam (Montana), the 144 mw Kootenai Falls Project (Montana), and a 138 mw development at the proposed high Katka dam site (Idaho).

The amount of water available for developing new consumptive uses in the Clark Fork of Montana is apparently limited because of prior rights for hydroelectric power. The 397 mw hydroelectric power plant at Noxon Rapids - owned and operated by Washington Water and Power - has a storage reservoir water right for 334,600 acre-feet and direct flow water rights of 35,000 cfs with a priority of 1960 and 15,000 cfs with a priority of 1974. The downstream Cabinet Gorge Power Plant, located just inside the Idaho state line has no preference over Montana water uses by virtue of Montana Law 85-1-122, wherein the Montana legislature authorized the impoundment or restraint of water by the Cabinet Gorge Facility, but with a provision that Montana irrigation and domestic water use above the dam would have preference over hydroelectric power production at Cabinet Gorge. Therefore, the water rights at Noxon Rapids are the limiting rights on the Clark Fork River.

Table I-5 presents a summary of the historical flows at Noxon Rapids and identifies the quantity of flows in excess of Washington Water and Power's present 50,000 cfs right which occurred between 1960 and 1979. Although the volume of water passed in excess of the 50,000 cfs flow right averages about 1.3 million acre-feet per year, the variability of this excess water on a year-to-year basis is such that no water is available for new appropriations in 3 years out of 10 on the average (Montana DNRC, Water Sciences Bureau, January 1981, Water Availability in the Clark Fork of the Columbia Basin). When excess flows are available, they generally occur between May 10 and June 25. Thus, the unclaimed water available to support new large-scale consumptive uses in the Clark Fork Basin of western Montana is somewhat limited and would require the use of storage facilities.

Consumptive Water Uses. Irrigation is the largest diversionary water use and the largest consumer of water in western Montana. Other water withdrawals include uses for municipal, rural, domestic, and industrial purposes. These uses are minor compared with irrigation.

The irrigation potential of the Montana Columbia River Basin has been identified by the Montana DNRC. Table I-6 shows that in addition to the 433,440 acres presently irrigated, there is a potential to provide water to an additional 1,376,937 acres of arable land.

The growth of irrigation in western Montana has apparently been on the order of 1 percent per year, according to Table I-6. There have been

TABLE I-5 SUMMARY OF HISTORICAL FLOWS AND WATER USE AT NOXON RAPIDS, 1960-1979

Monthly means in 1000 Acre-feet

Month	Discharge Through Turbines	Spills in Excess of 50,000 cfs[1]	Total Spills	Total Release
October	715.5	0	0	715.5
November	719.7	0	0	719.7
December	844.4	0	26.2	870.6
January	899.6	2.3	13.9	913.5
February	871.9	0	36.9	908.8
March	1,065.4	0	73.5	1,138.9
April	1,279.5	15.8	151.9	1,431.4
May	1,787.4	422.9	958.0	2,745.4
June	1,675.2	825.0	1,714.5	3,389.7
July	1,214.6	3.6	277.0	1,518.6
August	633.0	0	1.2	634.2
September	583.5	0	3.0	586.5
Total	12,316.7	1,269.6	3,256.1	15,572.8

[1]DNRC study indicates that average period of excess flows is May 10-June 25.

Source: Montana DNRC, Water Sciences Bureau, January 1981, Availability in the Clark Fork of the Columbia River Basin.

TABLE I-6 MONTANA COLUMBIA RIVER BASIN IRRIGATION POTENTIAL

Subbasin	Irrigated (Acres)	Irrigable (Acres)
Kootenai	9,993	191,094
Flathead	26,783	360,528
Upper Clark Fork	234,658	441,107
Lower Clark Fork	162,006	384,208
Total	443,440	1,376,937

Source: Montana DNRC. Irrigable lands include classes 1, 2, & 3

TABLE I-7 PROJECTIONS OF WESTERN MONTANA IRRIGATION

	(Acres)				
Projections	1970	1975	1980	2000	2020
PNWRBC Data	417,700	439,100	461,500[1]	563,100[1]	622,100[1]
OBERS[2]	438,600	--	459,600	466,600	476,600
Montana DNRC	417,700	--	450,600	516,400	582,100
Type IV R.B. Survey	477,500	--	573,700	840,500	1,240,000

[1]1970 to 1975 1% per year increase projected into the future.

[2]OBERS: Office of Business Economics, U.S. Department of Commerce, and Economic Research Service, USDA.

Source: Pacific Northwest River Basins Commission, June 1979, Water Today and Tomorrow, Vol. II, Vol. III Montana DNRC, August 1981, Water Resources Assessment Project.

several projections of new irrigation made over the past decade. These are also summarized in Table I-7. The projections vary depending upon the economic assumptions utilized. The Montana DNRC projections indicated in Table I-7 appear to be reasonable compared with the other sources of information. These projections were used in Table I-8 to show the resulting increase in irrigation water use in western Montana. The table shows that the current depletion on some 450,000 acres of irrigated land is on the order of 729,000 acre-feet per year. By the year 2020, the depletion on about 582,000 acres would be in excess of 1 million acre-feet per year.

The projected western Montana municipal, rural domestic, and industrial water withdrawals are presented in Table I-9. The municipal water use is projected to increase with population growth from about 79,400 acre-feet in 1980 to about 113,000 acre-feet by the year 2020. Normally about half of municipal water use is consumed, with the remainder returned to the stream. The amount of return depends on the type of wastewater treatment systems installed. Rural domestic water use is small and is shown in the table to decrease in the future as municipal type systems expand to include the rural water service; however, recent reductions in funds needed to expand municipal water systems may reverse this projected trend. Water use for livestock is not shown in the table but is also important in western Montana. The current livestock water use is estimated to be on the order of 8,000 acre-feet per year.

Industrial water use, as seen in Table I-9, is largely nonconsumptive. In 1970 water withdrawals of nearly 106,000 acre-feet per year resulted in a consumptive use of only 11,700 acre-feet per year. Since industrial discharges may decline in the future, Table I-9 projects only the consumptive uses of water. Unless thermoelectric generation or other types of high water-using industry are brought into western Montana, the industrial water use is projected to have only a modest increase in the future.

Water rights must be obtained from the Montana DNRC before water can be put to use. During the period of 1973 through 1979, Montana DNRC granted a total of 920 water use permits in the Clark Fork Basin for about 325,000 acre-feet of consumptive water use and about 15,000 acre-feet of nonconsumptive water use. In addition, there were 175 applications pending for a total of about 93,000 acre-feet of consumptive water use and about 6,000 acre-feet of nonconsumptive water use. A study by the Montana DNRC in 1981 identifies the potential conflict between new water rights for consumptive uses and the downstream Noxon Rapids hydroelectric water right.

TABLE I-8 PROJECTED WESTERN MONTANA IRRIGATION WATER USE

	YEAR				
	1970	1975	1980	2000	2020
1000 Acres Irrigated[1]	418	439	450	516	582
Diversions, 1000 Ac-Ft/Yr[2]	1,828	1,920	2,010	2,380	2,610
Depletions, 1000 Ac-Ft/Yr[2]	652	686	729	906	1,010

[1]Montana DNRC projection.
[2]Future diversions and depletions include supplemental supplies.

Source: Pacific Northwest River Basins Commission 1979 Report. Wright Water Engineers, Inc. Extrapolation.

TABLE I-9 PROJECTED WESTERN MONTANA MUNICIPAL, RURAL DOMESTIC, AND INDUSTRIAL WATER WITHDRAWALS.

	Water Use in Acre-Feet Per Year			
	1970	1980	2000	2020
Population (Mont. DNRC)	221,700	234,400	265,500	296,600
Employment (Mont. DNRC)	76,300	77,700	87,300	98,500
Municipal Water Use	63,200	79,400	95,500	113,000
Rural Domestic Use	8,100	5,600	4,500	3,400
Industrial Water Use	(105,900)[1]	11,900	13,400	15,100
Total Water Use	83,000	96,900	113,400	131,500

[1]Water consumed = 11,700 acre-feet per year. Future increased consumption estimated on basis of projected employment, and included in total water use.

Source: Pacific Northwest River Basins Commission, 1979 Report, Vol. III.

Hydropower is also an important water use upstream of Noxon Rapids. Thompson Falls on the Clark Fork has a 30 mw capacity, and there is a total of 4 mw of capacity at two small upstream hydroplants. The Kerr hydropower plant on the Flathead River has 197 mw, and upstream the Hungry Horse has 285 mw and Bigfork 4 mw. New consumptive water uses would not necessarily interfere with power production at these facilities.

Possible Future Interstate Conflicts. The growth in instream and consumptive water uses in the Columbia River Basin downstream of Montana could create a conflict if the future Montana water uses interfere with the downstream uses. Downstream water uses include irrigation and municipal and industrial water supplies, and the instream uses of hydroelectric power, navigation, and anadromous fish production. Another potential downstream water use, but one which has been prohibited by federal law, is the potential for interbasin diversion of water from the Columbia River into the Colorado River system.

In order to obtain a perspective of the relative growth of Montana water use compared to downstream states' water uses, data published by the Pacific Northwest River Basins Commission was analyzed. From Table I-10 it can be seen that the Montana population is projected to decrease from 3.5 percent of the total Columbia River Basin population in 1975 to only 2.8 percent in the year 2000. There is an accompanying decrease in Montana's percentage of consumptive water use in the Columbia River Basin. Montana's consumptive water use is currently about 6.1 percent of the total Columbia River Basin consumptive water use, while the year 2000 Montana water withdrawals are projected to be only 5.6 percent of the total.

Analysis of Tables I-8 and I-9 shows that Montana's increased consumptive use is likely to be on the order of 230,000 acre-feet more per year in the year 2000 compared to 1975. The year 2020 water consumptive use is projected to be about 350,000 acre-feet greater than the 1975 level of water consumption. Since most of this water use will occur in the Clark Fork River Basin and not the Kootenai River Basin, these depletions must be deducted from the present level of Clark Fork flows to ascertain the magnitude of change that will occur.

The average state line flow of the Clark Fork is presently 15,920,000 acre-feet per year. In the year 2020, increased depletions would reduce this flow to an average of about 15,570,000 acre-feet per year. If storage can be used to provide for anticipated increases in water use, this 3 percent reduction should not result in instate water

TABLE I-10 PROJECTED COLUMBIA RIVER BASIN (CRB) POPULATION, WATER USE, AND MONTANA PERCENTAGES

Withdrawals in 1000 acre-feet per year

	YEAR				
	1975	1980		2000	
		Low	High	Low	High
CRB Population (1000's)	6,444	7,121	7,321	8,872	9,929
Montana %	3.5	3.2		2.8	
CRB Irrigation	30,100	-	-	37,740	45,530
Montana %[1]	6.4	-		5.9	
CRB M&I	4,351	3,320	3,431	3,948	4,632
Montana %[2]	4.1	2.9		2.6	
Total CRB	34,451	-	-	41,688	47,162
Montana %	6.1			5.6	

[1] Montana diversion from Table I-6

[2] Montana use from Table I-7

Source: Pacific Northwest River Basins Commission, June 1979 report, Volumes II and III.

conflict with instream hydroelectric water rights. It was shown in Table I-5 that there is an average of 1.3 million acre-feet of water surplus to the hydroelectric plants' water rights.

The increased depletion of water in Montana would have very little effect on the Columbia River flows below the Clark Fork junction. The Montana contribution to the Clark Fork flows, based on the state line flows of Montana, would be reduced from 81 percent to 80 percent of flows in the Columbia River below Clark Fork.

The above figures indicate the small effects of increased Montana water use compared with a rather large basin-wide total water use increase. The percentages of increased water use could look quite different if Montana water use increases as projected, and the other states water uses increases are slower than projected.

The development in the Pacific Northwest is highly dependent upon the use of electric energy. Historically, electric energy has been supplied predominantly by hydroelectric power plants. Downstream of Montana on the Kootenai River, 809 mw of generating capacity are installed in British Columbia. Downstream of Montana on the Clark Fork-Columbia River system existing power plants of 19,596 mw plant capacity have identified expansion potentials of 29,818 mw of capacity.

The Pacific Northwest Region Power Planning Committee, consisting of federal, public, and private power planners, has published estimates of the average and peak loads for the West Group Area. The West Group Area includes the state of Washington, the panhandle of Idaho, all but the southeastern part of Oregon, a small part of northern California, and Bonneville Power Administration loads in western Montana and southern Idaho. It does not include service areas of Idaho Power Company, California-Pacific Utilities Company in eastern Oregon, Utah Power and Light Company, and Montana Power Company. West Group's firm contractual arrangements of West Group utilities with utilities outside its area are included in its loads.

The average energy demand is projected to increase from 17,490 mw in 1980-81 to 32,030 mw in 2000 and to 58,076 mw in the year 2020 (PNWRBC, April, 1981). Peak loads are projected to increase from 27,341 to 52,050 to 94,374 mw in 1980-81, 2000, 2020 respectively. Hydrology studies are conducted from time to time to compare the power generation with the load forecasts. A disparity of generating capacity is forecast under the projected loads, and additional power plants are planned to meet the indicated demands. The power planning studies indicate that an additional generating capacity will have to be constructed or future power loads

will have to be reduced through conservation. One primary result is that increased depletions in the Columbia River system, including Montana, which reduce hydropower generation potential may meet with opposition from the electrical energy sector. All of the states of the Pacific Northwest region are faced with the same problem - that is, the desire to increase consumptive uses of water while at the same time at least maintaining the hydropower resources of the region.

Another economic use of instream flows which competes for water with consumptive uses is navigation. The Columbia River channel, extending 106 miles upstream to Vancouver, Washington, can handle navigation service for ships drawing 40 feet. From that point upstream to the Pasco-Kinnewick area on the Columbia River and above Lewiston on the Snake River, barge channel navigation handled about 63.9 million tons of waterborne commerce in 1975. Tonnage is projected to increase to 110 million tons by the year 2000. In addition, there is recreational boating on the river system. Except for the planning of new navigation locks, there are apparently no foreseeable problems of interference between consumptive use and navigation on the Columbia River system -- if water availability is sufficient to satisfy hydropower requirements, navigation water needs will be satisfied also.

The Corps of Engineers is in the process of conducting the Columbia River and tributary study, which is a review of the management of existing projects and possible implementation of future projects. The primary conflict identified in this study is the competition of consumptive water uses, primarily associated with increased irrigation, with hydroelectric power generation. The study identifies peaking power plant resources and other hydropower and related hydraulic facilities.

Interbasin water diversions have been a long-standing issue in the Pacific Northwest region. Several preliminary proposals have been made for diverting water from the Columbia River or its tributaries to the Pacific southwest, either to the Colorado River for diversion and use or directly to California. Most of the interbasin diversion proposals seem to have been inspired by the U.S. Supreme Court decision in *Arizona* v. *California*.

The proposals which would have the greatest potential effect on Montana resources involve diversion of water from the Columbia River or its tributary, the Snake River. The diversion plans contemplate 2.0 to 15.0 million acre-feet of diversion per year. The first of the proposals was the Snake-Colorado Project, proposed in 1963 by the Los Angeles Department of Water and Power. The project would divert water from the Snake River near Hagerman, Idaho, through a proposed aqueduct to Lake Mead.

The Western Water Project, proposed in 1964, would divert 15 million acre-feet of flood water from the Columbia River above the Dalles to Lake Mead. Proposed that same year, the Yellowstone-Snake-Green Project would divert 2 million acre-feet per year from the Yellowstone River near Corwin Springs, Montana, to Henry's Fork of the Snake River in Idaho to replace water diverted from the Snake River near the Hoback Junction in western Wyoming into the Colorado River Basin. The Modified Snake- Colorado Project in 1965 proposed to pump 5 million acre-feet per year from the mouth of the Snake River upstream by means of 10 pumping plants utilizing the natural channel to Brownlee Reservoir near Weiser, Idaho, then divert the water over the mountains through eastern Oregon and western Nevada to Lake Mead. The Undersea Hose Project proposed to divert 12 million acre-feet of fresh water near the mouth of the Columbia under the Pacific Ocean into the southern California region.

Other interbasin diversions which would affect the Columbia River Basin include the NAWAPA Plan (The North American Water and Power Alliance). The Ralph M. Parsons Company (the contractor who devised the NAWAPA plan) proposed a series of diversions from Alaska through the Rocky Mountain Trench in Canada into the United States for distribution to several regions, including down the Columbia and Kootenai rivers into the Snake River of the Columbia River Basin and into the Colorado River system. A series of other interbasin and international diversions had been proposed by a variety of water planners, agencies, and others.

Comparing one proposal with another is not especially justified since the various plans are not related to one another. They were completed by different individuals with different objectives in mind. None of the proposals described above ever advanced very far beyond the paper study stage.

Nevertheless, the threat of interbasin transfers was real enough and, in the Congressional authorization for the Central Arizona Project, Senator Henry Jackson (D-Washington) forestalled the threat of interbasin transfers from the Pacific Northwest region. Section 201 of the Colorado River Basin Project Act (PL 90-537), authorizing the Central Arizona Project, directed a Westwide Water Plan to be conducted by the Secretary of Interior under the auspices of the Water Resources Council by 1977. The Act directed that the investigations include the long-range water supply available and the long-range water requirements in each water resource region of the western United States and develop a general plan to meet future water needs of the western United States. However, Section 201 also prohibited for 10 years any reconnaissance studies for importing water to the Colorado River Basin from any natural river drainage outside of the Colorado River Basin. Senator Jackson specifically had in mind

precluding diversions from the Columbia River to the Colorado River. The 10-year moratorium for study of interbasin diversions has been extended by Congress another 10 years to 1988.

Summary. It appears the opportunity for downstream conflict with Montana water use in the Columbia River system does exist. The Columbia River system is presently highly developed for instream hydropower uses. The potential for conflict exists even though Montana's potential consumptive uses in the Columbia River system are small compared to both the available water supply and the downstream development potential.

On the other hand, a potential internal water use conflict in Montana may overshadow any interstate water use conflict. The water rights acquired by the Noxon Rapids Power Plant include most of the flows of the Clark Fork River. New water developments may have to receive their water supply primarily from the springtime surplus of water over and above Noxon Rapids Power Plant capacity or be developed with the use of storage regulation from new or existing reservoirs.

The water planning process can also identify and confirm the potential Montana water depletions so that the Montana water position with regard to downstream states can be established and continued through equitable apportionment, interstate compact, or congressional water allocation.

East of the Continental Divide

The rivers of eastern Montana, including the Yellowstone and Missouri rivers and their tributaries, are important water resources for Montana. These rivers and the Little Missouri are in the headwaters of the Missouri River Basin. These areas contain about 82 percent of the land area and 77 percent of Montana's population.

Water uses from the Missouri River in Montana amount to withdrawals of about 6.7 million acre-feet per year and depletions of 3.16 million acre-feet per year at the 1975 level. The flow of the Missouri River at the North Dakota state line averages about 7,774,000 acre-feet per year.

In the Yellowstone River Basin, about 6,227,000 acre-feet per year flow into Montana from Wyoming. Diversions total about 3.49 million acre-feet, resulting in depletions of 1.65 million acre-feet per year. The outflow of the Yellowstone River from Montana at the 1975 level of depletions averages 8,741,000 acre-feet per year.

Irrigation accounts for about 82 percent of the Montana water consumption; reservoirs consume about another 15 percent; and depletion from

industrial, municipal, livestock, rural domestic and other uses amounts to about 3 percent. Instream nonconsumptive uses include fish, wildlife, recreation, water quality maintenance, and hydroelectric power. For the Yellowstone River, instream flow reservations have been established by the Board of Natural Resources and Conservation. The amounts vary by stream reach -- in the lower reach of the Yellowstone River, the instream flow reservation amounts to over 5 million acre-feet per year. The power plant at Yellowtail Dam on the Bighorn River, a tributary of the Yellowstone River, has an installed capacity of 252 mw. Yellowtail Dam also provides important river regulation for the Bighorn River in Montana and the Yellowstone River downstream of the Bighorn River.

Water reservations for the Yellowstone River also provide for the future irrigation of 235,000 acres of land, for future municipal uses, and for three future off-stream reservoirs to store water for consumptive uses.

There have been no water reservations established on the Missouri River or its tributaries in Montana. Hydroelectric power production is an important instream function on the Missouri River. There is 51 mw of installed hydroelectric power capacity at the Bureau of Reclamation's Canyon Ferry Dam. Five downstream power facilities of Montana Power Company have a combined capacity of 218 mw. Further downstream on the Missouri River in Montana is Fort Peck Dam, owned by the Corps of Engineers, with a capacity of 165 mw. Fort Peck Dam is one of six main stem Missouri River facilities operated by the Corps of Engineers under the Flood Control Act of 1944. Later in this report the purposes of these facilities and their operations are discussed in much greater detail.

The Yellowstone and Missouri rivers combine in Lake Sakakawea in North Dakota. The Missouri River is an important waterway through North Dakota, South Dakota, Nebraska, Iowa, Kansas and Missouri.

The Pick-Sloan Missouri Basin Program authorized by the 1944 Flood Control Act provided for five other dams besides Fort Peck to control floods on the Missouri River and provide main stem river water control, navigation, and incidental hydropower production. Numerous other storage projects on tributaries and irrigation projects on the main stem and primarily on tributaries were also included in the 1944 Act, along with the provision that downstream navigation is not to interfere with upstream consumptive uses of water. In the nearly forty years since the 1944 Flood Control Act, the main stem dams have been completed, but only a few of the irrigation projects have been implemented.

There is a large quantity of water flowing in the Missouri River and consequently a large potential for development of future consumptive uses. The lower basin states fear that further upstream diversions and depletions will reduce the high flow levels they want continued for the protection of navigation, hydropower production, and other instream values. On the other hand, the upper basin states view the maintenance of such downstream flow levels as threatening to future water development in the upper basin. The potenitals for conflict are many, but four current issues of particular interest:

1. Energy Transportation Systems, Inc. (ETSI) has purchased 50,000 acre-feet per year from South Dakota and the U.S. Bureau of Reclamation from Lake Oahe for slurry pipeline and other purposes. Although this quantity of water is only 0.2 percent of the flow of the Missouri River at Sioux City, Iowa, the states of Missouri, Iowa, Kansas, and Nebraska are very concerned that the sale of Oahe reservoir water will set a precedent.

Several states have taken action to protect their rights to use interstate waters. The State of Missouri passed legislation authorizing the Governor to enter an interstate compact with Iowa, Kansas, and Nebraska for the development of barge traffic on the Missouri River. Representative Bedell of Iowa has introduced H.R. 5278 to prohibit any state from selling or otherwise transferring interstate waters located in the state for use outside that state unless all other states in the drainage basin consent to the sale or transfer. The Attorneys General for the states of Iowa and Missouri have threatened litigation against South Dakota; and lastly, the lower basin states want an interstate compact on the Missouri to protect Missouri River flows for their use, thus preventing the upper Missouri states from depleting the flow in accordance with development provided by the 1944 Flood Control Act.

2. The High Plains Study deals with an even greater threat. This $6 million Department of Commerce study, authorized by Congress in 1976, looked at alternatives for assuring adequate water supplies to the midwestern states that use groundwater from the Ogallala formation. The states include Oklahoma, Colorado, Kansas, Nebraska, New Mexico and Texas. Depletion of water from the Ogalalla aquifer is estimated to result in the loss by the year 2020 of more than one third of the 14.3 million acres now irrigated from the aquifer. The High Plains Study Council, consisting of the governors of the six states, has chosen several sources of water that might be imported into the High Plains area. Two of the four alternatives would divert about 4 million acre-feet per year from the Missouri River at either Lake Francis Case behind Fort

Randall Dam, or at St. Joseph, Missouri. This project and its consequences are discussed more fully later in this report.

3. All of the upper basin states are identifying water development priorities for the 1980's. North Dakota's top priority is to develop 250,000 acres of irrigated land with water from the Garrison Reservoir Project. South Dakota wishes to withdraw 1.5 million acre-feet per year for irrigation in the Central South Dakota Project (CENDAK). Wyoming has authorized $114 million for water development as a first step in a possible $600 million statewide water development program.

4. Threats on upstream Missouri River water could even come from the Mississippi River. The Missouri River Division of the Corps of Engineers is completing a study of Mississippi River navigation that includes an analysis of effects of Missouri River flows. Navigation on the Missouri River produced about $20 million in benefits during 1980 for the transportation of 3 million tons of freight. In contrast, more than 50 million tons are transported annually on the Mississippi River. Preliminary results of the study indicate that regulation of the Missouri River has a significant effect on the flows of the Mississippi River. There are no current authorizations that would connect the Missouri River regulation to benefits on the Mississippi, but the Corps of Engineers study could lead to suggestions that Congress consider such authorizations.

SCOPE OF THIS STUDY

The potential for downstream, out-of-state conflicts with consumptive water uses in Montana exists both east and west of the Continental Divide. West of the Continental Divide in the Columbia River Basin, the upstream/downstream conflict potential is apparently masked by the existence of huge hydroelectric power water rights at the Montana-Idaho state line. This large water right at Noxon Falls has the effect of guaranteeing that practically all of the water leaving the State of Montana will meet downstream water needs.

In contrast, east of the Continental Divide in the Missouri and Yellowstone River basins, a considerable quantity of water is available in Montana for appropriation to future consumptive water uses. In addition, the threat of institutional constraints to further development, if not future water shortage in the Missouri River Basin, creates the potential for threat of out-of-state, downstream interference with the development of future consumptive uses of water in Montana.

For this reason, the Montana Department of Natural Resources and Conservation chose to concentrate the efforts of this study on the problems of interstate water conflicts on the Missouri River Basin. The suc-

ceeding chapters of this report present an in-depth study of the nature, scope, and timing of potential Missouri River Basin water conflicts. A legal analysis is presented on the three primary means of interstate water allocation: equitable apportionment, congressional apportionment, and interstate compact. The water programs of Montana are evaluated with regard to claiming water for interstate water allocation. Finally, a strategy is presented for Montana to proceed to achieve a Missouri River Basin water allocation.

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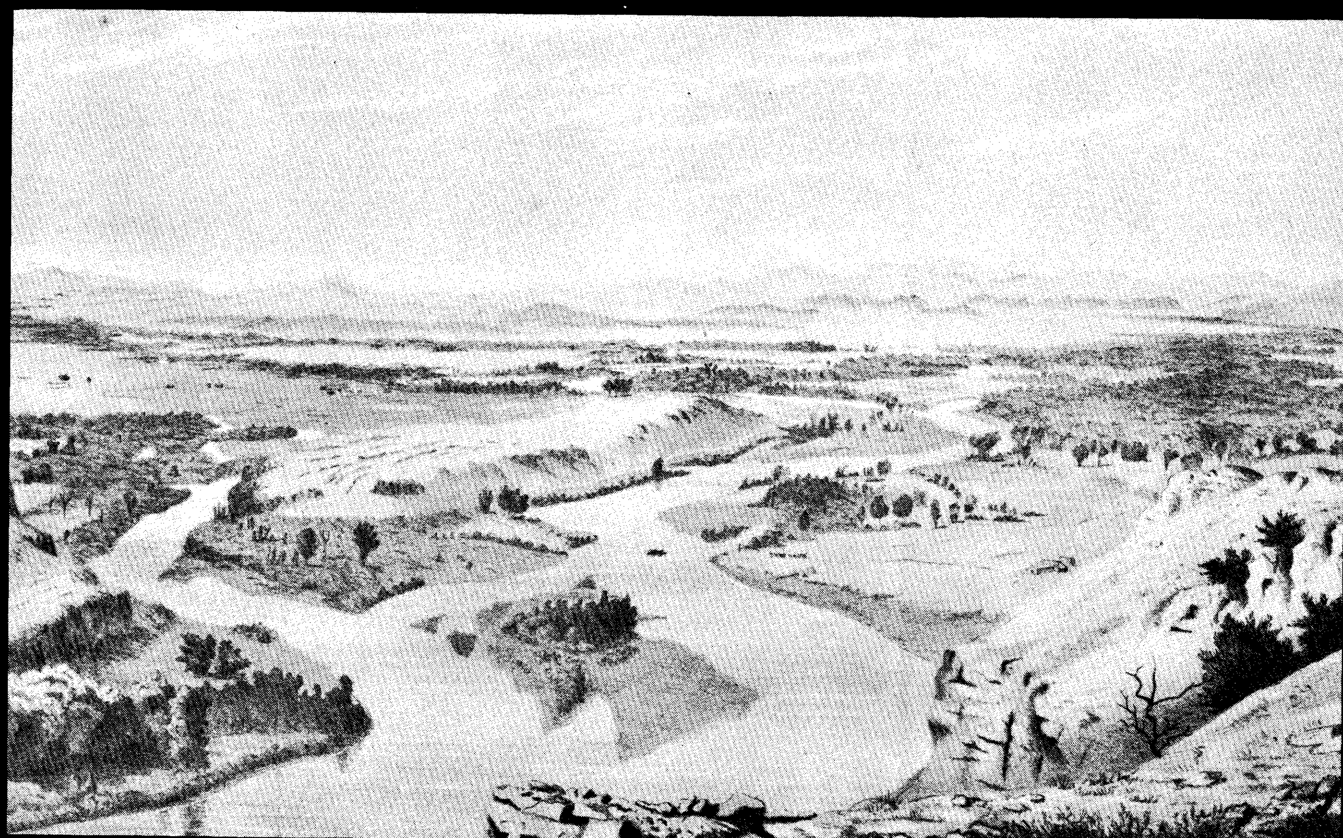


A. E. Mathews — 1867 THE THREE FORKS, HEADWATERS OF THE MISSOURI

CHAPTER II

Background Description And Analysis

CHAPTER II - BACKGROUND DESCRIPTION AND ANALYSIS

INTRODUCTION

This chapter describes the existing geographical, hydrological, and institutional framework for the Missouri River Basin system to provide a basis for understanding the potential water use conflicts which are discussed in Chapter III. Trends in current water use which may lead to those conflicts are qualitatively described, and the interaction between water use in the Missouri River and the Mississippi River is also presented.

GEOGRAPHICAL SETTING

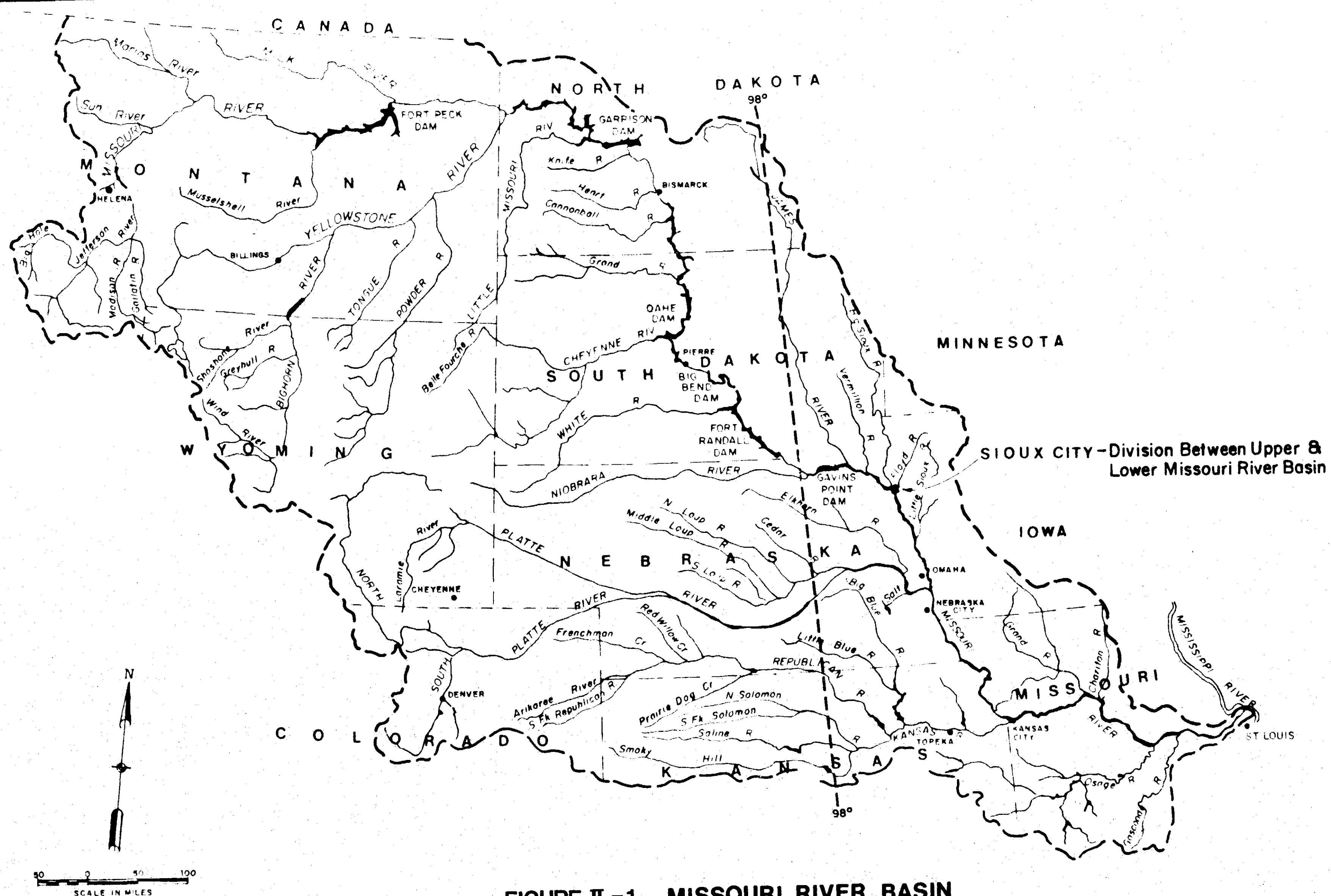
The Missouri River Basin in the United States is shown in Figure II-1. The area of the river basin is 523,900 square miles. About 23 percent of the land area of the basin, or 121,000 square miles, lies within Montana.

The headwaters of the Missouri River are in Montana. The Missouri River flows through Montana, North Dakota, and South Dakota; along the eastern borders of Nebraska and Kansas; and then through Missouri, where it joins the Mississippi River near St. Louis, Missouri.

The major upstream tributary of the Missouri River is the Yellowstone River. Its subtributaries, originating in Wyoming, are the Clarks Fork, Big Horn, Tongue, and Powder rivers. The major tributaries in western Dakota include the Little Missouri River and the Cheyenne River. Other western Dakota tributaries contribute relatively minor streamflows to the Missouri River, as do eastern Dakota tributaries. The Niobrara River and the James River are two other major tributaries which enter the Missouri River above Sioux City, Iowa.

Sioux City, Iowa, marks the division point between the upper and lower Missouri River basins. This point is marked by a U.S. Geological Survey stream gaging station and is a significant division point in the river system. Downstream of Sioux City, Iowa, the major tributaries are the Platte River, Kansas River, Grand River, and Osage River.

The upper Missouri, Yellowstone, and Platte rivers all head in the Rocky Mountains and derive their principal streamflow contribution from the snow melt of the high Rockies. The Missouri River tributaries in Montana, Wyoming, Colorado, and portions of North and South Dakota, Nebraska, and Kansas flow through areas which are characterized as semi-



Source: USACE
Missouri River Division

FIGURE II-1 MISSOURI RIVER BASIN

arid. The portion of the Missouri River through central and eastern North Dakota, South Dakota, Nebraska, and Kansas flows through areas characterized as dry subhumid. The middle Missouri River reach -- including eastern Nebraska, eastern Kansas, and Iowa -- is characterized as a moist subhumid area. The lower Missouri River, primarily in the State of Missouri, is characterized as a humid area. The relationship of climate to the rivers and streams in the Missouri River Basin plays an important role in water use and the potential competition for water supplies. For example, irrigation is required for successful farming in much of the semi-arid zone and is the largest major use of water.

MONTANA'S FLOW CONTRIBUTION TO THE MISSOURI RIVER

Montana is an important contributor of water in the Missouri River system. At the 1975 level of depletion, the average annual outflow from Montana in the upper Missouri River is 7,774,000 acre-feet per year; and the Montana state line average flow of the Yellowstone River and other tributaries is about 8,804,000 acre-feet per year. This is 76 percent of the average streamflow at Sioux City, Iowa, and 30 percent of the streamflow at the mouth of the Missouri River.

The Missouri River streamflows are greatly influenced by the variable snow melt runoff in the Rocky Mountains, which occurs essentially in the three-month period of April through June. The runoff from year to year varies proportionately with the winter snow pack; and if spring rains combine with the snow melt runoff, extreme flooding could occur in the main stem of the Missouri River.

The streamflows in the Missouri River at various locations are summarized in Table II-1. The Montana water production is an important part of the flow of the upper Missouri River, but the water yield from downstream states becomes a more significant portion of the river flows as the stream travels downstream. Table II-1 illustrates this factor by indicating the percentage of Montana's water contribution to and the percentage of Montana-North Dakota state line flow of the total flow at various points on the Missouri River. On the basis of long-term average annual flows, Montana contributes about 62 percent inflow to the Garrison Reservoir; about 48 percent of the streamflow at Sioux City, Iowa; and about 19 percent of the streamflow near the mouth of the Missouri River near Hermann, Missouri. These percentages are approximate because no allowance has been made for river conveyance loss as the water flows downstream.

The Missouri River main stem reservoir system evens out high and low flows over a period of years, so that an individual low flow year is no

TABLE II-1 MONTANA WATER CONTRIBUTION AND STATE LINE STREAMFLOWS AS A PERCENTAGE OF MISSOURI RIVER STREAMFLOWS

RIVER REACH	Average Annual[1]			Low Flow Period[5]	
	Flow,[1] 1,000 A-F	Montana[2,4] Contribution %	Montana[3,4] Outflow %	Flow 1,000 A-F	Montana[4] Outflow %
Fort Peck Dam	6,537	100	-	4,030	-
Garrison Inflow	16,578	62	100	11,225	100
Oahe Dam	18,255	57	91	11,944	94
Fort Randall Dam	18,905	55	88	12,056	93
Gavins Point Dam	20,273	51	82	13,160	86
Sioux City	21,725	48	76	13,849	81
Omaha	23,016	45	72	14,370	78
Nebraska City	27,314	38	61	16,429	68
Kansas City	36,527	28	45	21,400	52
Boonville	42,666	24	39	26,249	43
Hermann	54,559	19	30	37,631	30

[1]1975 level of flows, 1898-1979 period.

[2]Inflow to Montana is 6,227,000 acre-feet per year from Wyoming in the Yellowstone River basin.

[3]Garrison inflow is approximately the Montana State line flow.

[4]Percentage approximate because no adjustment made for conveyance losses.

[5]1934-1942 period.

Source: Corps of Engineers, US Army, Missouri River Division, Mainstem Reservoir Regulation Studies.

longer significant downstream of the reservoirs. However, the effects of low flow years can be seen during the 9-year low period from 1934 through 1942. During this period the contribution from Montana and Wyoming (streamflow above Garrison Reservoir) maintains a greater percentage of the streamflow through the river system than is maintained in an average period. This is illustrated in Table II-1. During the long-term average, the Montana portion of the Sioux City flow is 76 percent; whereas, in the low flow period, the Montana contribution is 81 percent.

ROLE OF THE MAIN STEM RESERVOIRS

Along the main stem of the Missouri River are six major dams and reservoirs. These include Fort Peck Dam and Reservoir in Montana; Garrison Dam and Lake Sakakawea in North Dakota; Oahe Dam in South Dakota and Lake Oahe in North and South Dakota; and, downstream of Oahe Dam, Big Bend Dam, Fort Randall Dam, and Gavins Point Dam (see Figure II-1). With the exception of Fort Peck Reservoir, the major main stem dams and reservoirs (Garrison, Oahe, Big Bend, Fort Randall, and Gavins Point) were authorized by the Flood Control Act of 1944 (P.L. 534, 78th Congress, Second Session). Fort Peck Reservoir was authorized by the Rivers and Harbor Act of 1935 with authorization for the hydropower added by the Fort Peck Power Act of 1938. The development of these reservoirs institutionalized the upstream-downstream relationship of water in the Missouri River.

The Flood Control Act of 1944 approved a plan of development for the Missouri River Basin based upon: (1) a plan by the Corps of Engineers as presented in House Document 475 [78th Congress, Second Session], (2) a plan by the Bureau of Reclamation described in Senate Document 191 [78th Congress, Second Session], and (3) a coordination of these two plans as presented in Senate Document 247 [78th Congress, Second Session]. As provided by the Act:

> "The general comprehensive plan set forth in House Document 475 and Senate Document 191, 78th Congress, Second Session, as revised and coordinated by Senate Document 247, 78th Congress, Second Session, are hereby approved and the initial stages recommended are hereby authorized and shall be prosecuted by the War Department and the Department of the Interior as speedily as may be consistent with budgetary requirements [(Section 9(a)]."

The Act included more than 100 potential reservoirs, several hundred irrigation units, pumping projects and canal systems, and more than 500 miles of levees.

These congressional documents, in turn, contain general language concerning project purposes and do not detail specific allocations of reservoir storage or yield for project purposes. For example, House Document 475 states:

> "In addition to providing flood control benefits on the Missouri and Mississippi Rivers, the comprehensive plan would also provide for the most efficient utilization of the waters of the Missouri River basin for all purposes, including irrigation, navigation, power, domestic, and sanitary purposes, wildlife, and recreation." (Section 45, House Document 475).

Section 49 of House Document 475 indicates:

> "In connection with the development of the multiple purpose projects, those shown for the Missouri River will provide for the maximum practicable storage water of the main stem. The water to be impounded in these, as well as other multiple purpose structures...will be utilized to produce the maximum practicable development of irrigation, navigation, power and other multiple purposes. However, sufficient storage will be provided in each reservoir to provide for the needs of local flood protection downstream from the reservoir as well as for the needs of the general comprehensive plan for flood control for the Mississippi River basin. To provide for the maximum utilization of the water stored in multiple purpose reservoirs, a plan would be worked out for each structure in calibration with the various water use agencies involved."

Allocation of storage to various functions in the main stem projects is based on the allocations approved by the Chief of Engineers in July, 1960, as adjusted to recognize subsequent sediment accumulations. The storage currently allocated to each specific use is given in main stem reservoir regulation studies (Missouri River Division, U.S. Army Corps of Engineers, "Missouri River Main Stem Reservoir Regulation Studies," Series 1-80, March, 1980, pp. 8-9).

An important component of the 1944 Flood Control Act is the O'Mahoney-Millikin Amendment [(Section 1(b)] which subordinates navigation to other project purposes. This amendment provides a basis for reservoir operation to the U.S. Army Corps of Engineers.

"The use for navigation, in connection with the operation and maintenance of such works herein authorized for construction, of water arising in States lying wholly or partly west of the ninety-eighth meridian shall be only such use as does not conflict with any beneficial consumptive use, present or future, in States lying wholly or partly west of the ninety-eighth meridian, of such waters for domestic, muncipal, stock water, irrigation, mining, or industrial purposes.

While the Flood Control Act of 1944 did not specifically allocate storage or reservoir yield to specific project purposes, Senate Document 191 proposed irrigation projects from the headwaters to Sioux City, Iowa, totaling 4,760,400 acres of new land and 446,304 acres of supplemental supply, for a total of 5,206,704 acres to be benefited. This included 448,960 acres in Wyoming; 1,212,930 acres in Montana; 1,266,440 acres in North Dakota; 972,510 acres in South Dakota; 102,999 acres in Colorado; 1,009,375 acres in Nebraska; and 193,490 acres in Kansas. Some state interests support the concept that the incorporation of this language authorizing these irrigation developments allocates the required water for irrigation to the respective states.

One important aspect of the Missouri River Basin project is that the Bureau of Reclamation was designated to market water for consumptive uses and to market the generated hydroelectric power. The power marketing function has now been assigned to the Western Area Power Administration (WAPA). The Corps of Engineers controls the flood control and navigation functions of the main stem reservoirs.

Rules, Priorities, and Criteria for Main Stem Reservoir Operation

The general guidance provided by the authorizing documents for the main stem reservoirs has been used as a basis by the Corps of Engineers for developing necessary specific operating policies for the main stem reservoirs.

The general objective of existing Corps of Engineers operating policies is to provide a flexible operating policy which will change as new demands develop.

The following general approach was developed and generally agreed upon during planning and design of the reservoirs. It is observed in operation planning and in subsequent reservoir regulation procedures (U.S. Army Corps of Engineers, Missouri River Division, "Missouri River

Main Stem Reservoir System, Reservoir Regulation Manual, Master Manual," 1979, P. IX-1):

> "First, flood control will be provided for by observation of the requirements that an upper block of the intermediate storage space in each reservoir will be vacant at the beginning of each years flood season, with evacuation scheduled in such a manner that flood conditions will not be significantly aggravated if at all possible.
>
> "Second, all irrigation and other upstream water uses for beneficial consumptive purposes during each year will be allowed for.
>
> "Third, downstream municipal and industrial water supply and water quality requirements will be provided for.
>
> "Fourth, the remaining water supply available will be regulated in such a manner that the outflow from the reservoir system at Gavins Point provides for equitable service to navigation power.
>
> "Fifth, by adjustment of releases from the reservoirs above Gavins Point, the efficient generation of power to meet the areas needs consistent with other uses of power market conditions will be provided for.
>
> "Sixth, insofar as possible without serious interference with the foregoing functions, the reservoirs will be operated for maximum benefits to recreation, fish and wildlife."

Corps of Engineers operating policies for the main stem reservoirs recognize that water resource development in the Missouri River Basin is still in progress and state: (Master Manual, P. IX-2):

> "...The main stem system will be operated to achieve the maximum possible overall benefits consistent with the priorities established by law, the availability of water supply and the provision of equitable service to authorized functions. As water resource development progresses or as a result of changing national and

regional goals and policies, service requirements for the main stem system and its components will change."

The Corps Master Manual states further (P. XII-4):

> "As basin development continues, with more tributary reservoirs coming into operation, greater blocks of land placed under irrigation, downstream channel improvements accomplished, and levee projects completed, further analysis will need to be made of developed storage allocation."

Based on these general regulation rules, the total storage behind each of the six main stem reservoirs has been divided into four main pools: (1) exclusive flood control, (2) flood control and multiple use, (3) carry-over and multiple use, and (4) inactive. The carry-over, multiple use pool is a major source of water for multiple use purposes. Table II-2 contains a breakdown of the storage allocations and other engineering data for each reservoir.

Long range regulation studies have been made to establish and demonstrate the capabilities of the system and to establish criteria for planning, design, and operational purposes. Annual operating plans are published by the Reservoir Control Center of the U.S. Army Corps of Engineers, Missouri River Division. These annual operating plans are published for the coming year and also summarize actual operating conditions for the past year (e.g., U.S. Army Corps of Engineers, Missouri River Division, "1981-1982 Annual Operating Plan", September 1981). In addition, five-year plans and special purpose plans are published. These annual operating plans provide detailed operating rules and procedures for the main stem reservoirs.

In summary:

(1) Authorizing legislation and documents for the main stem reservoirs do not allocate storage volumes or reservoir yields for specific project purposes, nor do the legislation or accompanying documents detail or require specific operating procedures for the six main stem reservoirs.

(2) The Corps of Engineers has developed reservoir rule curves and operating policies which are consistent with the authorizing legislation and documents and provide flexibility for changes as new demands or changed demands occur for Missouri River water development. These

TABLE II-2- SUMMARY OF ENGINEERING DATA — MISSOURI RIVER MAIN STEM RESERVOIRS

ITEM NO.	SUBJECT	FORT PECK LAKE	GARRISON DAM — LAKE SAKAKAWEA	OAHE DAM — LAKE OAHE	BIG BEND DAM — LAKE SHARPE	FORT RANDALL DAM — LAKE FRANCIS CASE	GAVINS POINT DAM — LEWIS & CLARK LAKE	TOTAL	ITEM NO.
1	Location of Dam	Near Glasgow, Montana	Near Garrison, N. Dak.	Near Pierre, S. Dak	21 mi. upstream Chamberlain, S.D.	Near Lake Andes, S. Dak	Near Yankton, S. Dak		1
2	River Mile — 1960 mileage	Mile 1771.5	Mile 1389.9	Mile 1072.3	Mile 987.4	Mile 880.0	Mile 811.1		2
3	Total & Incremental Drainage Areas, square miles	57,500	181,400 (2) 123,900	243,490 (1) 62,090	249,330 (1) 5,840	263,480 (1) 14,150	279,480 (1) 16,000		3
4	Approximate length of full Reservoir (*in Valley Miles*)	134, ending near Zortman, Mont	178, ending near Trenton, N.D.	231, ending near Bismarck, N.D.	80, ending near Pierre, S.D.	107, ending at Big Bend Dam	25, ending near Niobrara, Nebr	755 Miles	4
5	Shoreline — Miles (3)	1520 (*El. 2234*)	1340 (*El. 1837.5*)	2250 (*El 1607.5*)	200 (*EL. 1420*)	540 (*El. 1350*)	90 (*El. 1204.5*)	5,940 miles	5
6	Average total & incremental inflow in cfs	10,200	25,600 15,400	28,900 3,300	28,900	30,000 1,100	32,000 2,000		6
7	Max. Discharge of Record near Damsite in cfs	137,000 (*June 1953*)	348,000 (*April 1952*)	440,000 (*April 1952*)	440,000 (*April 1952*)	447,000 (*April 1952*)	480,000 (*April 1952*)		7
8	Construction started — Cal. yr.	1933	1946	1948	1959	1946	1952		8
9	In operation (4) Cal. yr	1940	1955	1962	1964	1953	1955		9
	DAM AND EMBANKMENT								
10	Top of Dam, Elev. ft. msl	2280.5	1875	1660	1440	1395	1234		10
11	Length of Dam in feet	21,026 (*excluding spillway*)	11,300 (*including spillway*)	9,300 (*excluding spillway*)	10,570 (*including spillway*)	10,700 (*including spillway*)	8,700 (*including spillway*)	71,596 feet	11
12	Damming Height, feet (5)	220	180	200	78	140	45	863 feet	12
13	Maximum Height, feet (5)	250.5	210	245	95	165	74		13
14	Max. Base width, total & w/o Berms, feet	3500;2700	3400; 2050	3500;1500	1200;700	4300;1250	850;450		14
15	Abutment Formations (*Under Dam & Embankment*)	Bearpaw shale and Glacial Till	Fort Union Clay-Shale	Pierre shale	Pierre shale & Niobrara chalk	Niobrara Chalk	Niobrara chalk & Carlile shale		15
16	Type of fill	Hydraulic & rolled earth fill	Rolled earth fill	Rolled earth fill & shale berms	Rolled earth, shale, chalk fill	Rolled earth fill & chalk berms	Rolled earth & chalk fill		16
17	Fill quantity, cu. yds.	125,628,000	66,500,000	55,000,000 & 37,000,000	17,000,000	28,000,000 & 22,000,000	7,000,000	358,128,000 cu. yds.	17
18	Volume of concrete (*Cu. yds.*)	1,200,000	1,500,000	1,045,000	540,000	961,000	308,000	5,554,000 cu. yds.	18
19	Date of closure	24 June 1937	15 April 1953	3 August 1958	24 July 1963	20 July 1952	31 July 1955		19
	SPILLWAY DATA								
20	Location	Right bank — remote	Left bank — Adjacent	Right bank — remote	Left bank — adjacent	Left bank — adjacent	Right bank — adjacent		20
21	Crest Elevation, msl	2225	1825	1596.5	1385	1346	1160		21
22	Width (*including piers*) in feet	820 gated	1336 gated	456 gated	376 gated	1000 gated	664 gated		22
23	No., Size and Type of Gates	16—40'x25' Vertical Lift Gates	28-40'x29' Tainter	8-50'x23.5' Tainter	8-40'x38' Tainter	21-40'x29' Tainter	14-40'x30' Tainter		23
24	Design Discharge Capacity, cfs	275,000 at elev. 2253.3	827,000 at elev. 1858.5	304,000 at elev. 1644.4	390,000 at elev. 1433.6	620,000 at elev. 1379.3	584,000 at elev. 1221.4		24
25	Discharge Capacity at Maximum Operating Pool, cfs	230,000	660,000	80,000	270,000	508,000	345,000		25
	RESERVOIR DATA (6)								
26	Max. Operating Pool Elev. & Area	2250 msl 249,000 acres	1854 msl 383,000 acres	1620 msl 373,000 acres	1423 msl 64,000 acres	1375 msl 102,000 acres	1210 msl 32,000 acres	1,203,000 acres	26
27	Max. Nor. Op. Pool Elev. & Area	2246 msl 240,000 acres	1850 msl 368,000 acres	1617 msl 359,000 acres	1422 msl 63,000 acres	1365 msl 95,000 acres	1208 msl 29,000 acres	1,154,000 acres	27
28	Base Flood Control Elev. & Area	2234 msl 212,000 acres	1837.5 msl 315,000 acres	1607.5 msl 312,000 acres	1420 msl 59,000 acres	1350 msl 78,000 acres	1204.5 msl 25,000 acres	1,001,000 acres	28
29	Min. Oper. Pool Elev. & Area	2160 msl 92,000 acres	1775 msl 129,000 acres	1540 msl 118,000 acres	1415 msl 51,000 acres	1320 msl 42,000 acres	1204.5 msl 25,000 acres	457,000 acres	29
	Stor. Allocation, Elev. & Cap.								
30	Exclusive Flood Control	2250-2246 977,000 a.f.	1854-1850 1,502,000 a.f. (10)	1620-1617 1,097,000 a.f.	1423-1422 63,000 a.f.	1375-1365 985,000 a.f.	1210-1208 61,000 a.f.	4,685,000	30
31	Flood Control & Multiple Use	2246-2234 2,704,000 a.f.	1850-1837.5 4,286,000 a.f. (10)	1617-1607.5 3,326,000 a.f.	1422-1420 122,000 a.f.	1365-1350 1,316,000 a.f.	1208-1204.5 95,000 a.f.	11,851,000	31
32	Carryover Multiple Use	2234-2160 10,945,000 a.f.	1837.5-1775 13,372,000 a.f. (10)	1607.5-1540 13,463,000 a.f.		1350-1320 1,732,000 a.f.		39,512,000	32
33	Inactive	2160-2030 4,263,000 a.f.	1775-1673 4,975,000 a.f.	1540-1415 5,451,000 a.f.	1420-1345 1,698,000 a.f.	1320-1240 1,570,000 a.f.	1204.5-1160 348,000 a.f.	18,325,000	33
34	Gross	2250-2030 18,909,000 a.f.	1854-1673 24,137,000 a.f. (10)	1620-1415 23,337,000 a.f.	1423-1345 1,883,000 a.f.	1375-1240 5,603,000 a.f.	1210-1160 504,000 a.f.	74,373,000	34
35	Reservoir filling initiated	November 1937	December 1953	August 1958	November 1963	January 1953	August 1955		35
36	Initially reached Min. Oper. Pool	27 May 1942	7 August 1955	3 April 1962	25 March 1964	24 November 1953	22 December 1955		36
37	Est. Annual Sediment Inflow	17,500 a.f. 1080 yrs	38,100 a.f. 640 yrs	32,300 a.f. 730 yrs	4,400 a.f. 430 yrs	16,600 a.f. 370 yrs	2,500 a.f. 210 yrs	111,400 a.f.	37
	OUTLET WORKS DATA								
38	Location	Right bank	Right bank	Right bank		Left bank			38
39	Number and size of conduits	2—24'-8" dia. (*No's. 3 & 4*)	1-26' dia. and 2-22' dia.	6-19.75' dia. upstream, 18.25' dia. downstream	None (7)	4-22' diameter	None (7)		39
40	Length of Conduits in feet (8)	No. 3—6,615, No. 4—7,240	1529	3496 to 3659		1013			40
41	No., Size and Type of Service Gates	1—28' dia. cylindrical gate 6 ports 7.6'x8.5' high (*net opening*) in each control shaft	1-18'x24.5' Tainter gate per conduit for fine regulation	1-13'x22' per conduit, vertical lift, 4 cable suspension and 2 hydraulic suspension (*fine regulation*)		2-11'x23' per conduit, vertical lift, cable suspension, also one vert. lift line regulating gate at d.s. end of tunnel #10			41
42	Entrance Invert Elevation	2095	1672	1425	1385 (12)	1229	1180 (12)		42
43	Avg. Discharge Cap. per conduit & total	Elev. 2250 22,500 cfs—45,000 cfs	El.;. 1854 30,400 cfs-98,000 cfs	Elev. 1620 18,500 cfs-111,000 cfs		Elev. 1375 32,000 cfs-128,000 cfs			43
44	Present Tailwater Elev. (msl)	2032—2036 5,000—35,000 cfs	1672-1680 15,000-60,000 cfs	1423-1428 25,000-55,000 cfs	1351-1356 (11) 25,000-100,000 cfs	1230-1239 5,000-60,000 cfs	1158-1165 15,000-60,000 cfs		44
	POWER FACILITIES AND DATA								
45	Avg. Gross Head avail. in ft. (13)	193	154	185	69	115	45	761 feet	45
46	Number and size of conduits	No. 1-24'8" dia.; No. 2-22'4" dia.	5-29' dia., 25' penstocks	7-24' dia., imbedded penstocks	None; direct intake	8-28' dia., 22' penstocks	None; direct intake		46
47	Length of conduits in feet (8)	No. 1-5,653; No. 2-6,355	1,829	From 3,280 to 4,005		1,074		55,083 feet	47
48	Surge Tanks	PH#1: 3-40' dia.; PH#2: 2-65' dia.	65' dia., 2 per penstock	70' dia., 2 per penstock	None	59' dia., 2 per alternate penstock	None		48
49	No., type and speed of turbines	5-Francis, PH#1-2-128.5, 1-164 rpm: PH#2-2-128.6 rpm	5-Francis, 90 rpm	7 Francis, 100 rpm	8-Fixed blade, 81.8 rpm	8-Francis, 85.7 rpm	3-Kaplan, 75 rpm	36 Units	49
50	Disch. Cap. at Rated Head-cfs	PH#1 units 1&3 170', 2-140' 8,800 cfs, PH#2-2-170'-7,200 cfs	150' 38,000 cfs	185' 54,000 cfs	67' 103,000 cfs	112' 44,500 cfs	48' 36,000 cfs		50
51	Generator Rating, kw	2-43,500; 1-18,250; 2-40,000	3-80,000; 2-95,000	85,000	58,500	40,000	33,333		51
52	Plant capacity, kw	185,250	430,000	595,000	468,000	320,000	100,000	2,098,000 kw	52
53	Dependable capacity, kw (9)	182,000	368,000	578,000	536,000	287,000	74,000	2,026,000	53
54	Average Annual Energy Million kwh (13)	1,038	2,505	2,762	1,015	1,752	698	9,771	54
55	Initial Gen., First & Last Unit	July 1943 — June 1961	January 1956 — October 1960	April 1962 — June 1963	October 1964 — July 1966	March 1954 — January 1956	September 1956 — January 1957	July 1943 — July 1966	55
56	Estimated cost January 1979 Completed project	$156,600,000	$294,800,000	$345,200,000	$107,100,000	$197,400,000	$48,100,000	$1,149,200,000	56

REMARKS

(1) Includes 4,280 square miles of non-contributing areas
(2) Includes 1,350 square miles of non-contributing areas
(3) With pool at base of flood control.
(4) Storage first available for regulation of flows
(5) Damming height is height from low water to maximum operating pool. Maximum height is from average streambed to top of dam
(6) Based on latest available storage data:
(7) River regulation is attained by flows over low-crested spillway and through turbins
(8) Length from upstream face of intake to downstream face of outlet or to sprial case
(9) Based on 8th year (1961) of drought drawdown. (From study 1-80 1980)
(10) Storage volumes are exclusive of Snake Creek arm
(11) Affected by level of Lake Francis Case. Applicable to pool at elevation 1350
(12) Spillway Crest
(13) Based on study 1-80 1980

Corps of Engineers, U.S. Army
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rule curves and operating curves are developed in coordination with other federal and state agencies.

Water Rights/Institutional Arrangements for Main Stem Reservoirs

Water rights and institutional arrangements concerning water stored in the six main stem reservoirs vary by state. In accordance with the 1944 Flood Control Act and Section 8 of the Reclamation Act, the Bureau of Reclamation must apply to the respective states for project water rights for irrigation and other consumptive uses from the main stem reservoirs.

Water rights for Fort Peck Reservoir are not presently quantified. However, as required by the Montana water rights adjudication program, the Corps of Engineers and Bureau of Reclamation have submitted claims for water. The claims from Fort Peck cover water for various purposes including navigation, irrigation, fish and wildlife, municipal, and other uses. Under a master agreement with the Bureau of Reclamation, Montana DNRC has the authority to market 300,000 acre-feet of water from Fort Peck Reservoir for industrial uses. Each subcontract for industrial water will follow an approval process whereby the Bureau will approve the subcontract as to form and the state will issue water rights for the use.

In North Dakota, the Garrison Diversion District holds necessary water rights for irrigation water diverted from Garrison Reservoir. The Garrison Diversion District also has a service agreement with the Bureau of Reclamation to provide necessary irrigation water to the District once necessary distribution facilities are constructed. If a major industry wished to acquire water from Garrison Reservoir for industrial purposes, the industry would first need a permit from the state (this is a conditional water permit which would become a perfected water right once the water is put to beneficial use) and then must also obtain a water service agreement from the Bureau of Reclamation.

A similar situation exists in South Dakota and Nebraska. In South Dakota, a party must have both a South Dakota water storage right and a water service contract with the Bureau of Reclamation before diversion for a beneficial use can be made from the main stem reservoir. The water storage right and the water service contracts are necessary no matter what the beneficial use: irrigation, municipal and industrial use, or out-of-state energy development.

In the case of Nebraska, recent legislation passed by the Nebraska state legislature requires appropriators to file for a water right to

appropriate water from the Missouri River. However, the Nebraska Department of Water Resources is not enforcing the statute because of the abundance of water in the Missouri River at the present time. A water service contract would also be required from the Bureau of Reclamation for appropriating water from the main stem reservoirs.

In summary, it appears that both the states and the Bureau of Reclamation have control over appropriation of water from the main stem reservoirs for beneficial use.

Water Management in the Main Stem of the Missouri River During Low Flow Periods

Present operating policy for the main stem reservoirs during drought periods results in a reduced water supply for power and navigation. With less than normal water supply, navigation and power releases are based on existing and anticipated system storage and may provide less than full service navigation requirements. Under such conditions, winter power releases may also be reduced. Corps reservoir system operating plans detail various releases from main stem reservoirs for various levels of storage.

No specific information appears to have been developed at the present time concerning reallocation of main stem water storage allocations if the major irrigation projects detailed in the authorizing legislation and documents were developed. Shortages will exist in individual upstream projects because of limitations in water supplies on tributaries. However, no shortages to diversions from the main stem Missouri River are foreseeable according to available studies.

At the present time the allocation of water among competing uses during periods of low flow is a relatively simple process for the Corps of Engineers in operating the main stem reservoirs. In accordance with the O'Mahoney-Milliken Amendment, only navigation is affected by water shortages. Hydropower production is considered incidental to the operation of the reservoirs for other purposes. These present operating policies are developed in the same manner as other reservoir rule curves and operating policies and are described in the various reservoir regulation manuals of the Missouri River Division of the Corps. During future drought periods with a substantial increase in irrigation and other consumptive uses, the operations will follow the present cooperative and interagency procedures (which are dependent upon the Corps operating procedures and rule curves) unless there is a modification of the main stem project authorization, such as by further amendment to the Pick-Sloan Missouri Basin Program (Flood Control Act of 1944).

Unappropriated Or Unallocated Water

Storage in the six main stem reservoirs is approximately equivalent to three years of average runoff at Gavins Point. (Approximately 75 million acre-feet of storage exists in the six main stem reservoirs.) As a result of this substantial volume of storage, spills can be minimized.

Many of the proposed irrigation units included in the authorizing documents and legislation are yet to be developed, or have not been developed to the extent proposed in the authorizing documents. As a consequence, the significant consumptive use associated with the more than two million acres of new irrigation land described in the authorizing documents is yet to be felt. However, despite this lower level of consumptive use, it would be difficult to say that "surplus" water exists in the Missouri River Basin today.

Regulation studies for the Missouri River main stem reservoir system by the Corps of Engineers indicate that available water supply at present is not adequate to provide a full navigation season 89 percent of the time under hydrologic conditions similar to 1898-1979. Service of at least 5.5 months duration can be provided with dredging in a period of extended drought conditions. In addition, the operation of the main stem reservoirs is optimized each year in annual operating plans for the production of hydroelectric power in concert with navigation, river water quality maintenance, accumulation of storage, and other purposes.

The O'Mahoney-Millikin Amendment, however, probably gives priority to irrigation for use of the main stem water (see Chapter V). Therefore, while there is no "surplus water" at the present time, future irrigation and other water depletions can occur at the expense of navigational and hydropower uses.

MISSISSIPPI RIVER DEMANDS FOR MISSOURI RIVER WATER

The congressional authorizations for the six main stem reservoirs on the Missouri do not include language authorizing operation of these reservoirs for benefits on the Mississippi River. Operation of the main stem Missouri River reservoirs may provide incidental benefits on the Mississippi River below the confluence of the Missouri for flood control and increased availability of water for navigation, water quality control, municipal and industrial water supply, and fish and wildlife conservation. This is especially true for the Mississippi River reach between the confluence of the Missouri and Mississippi and the confluence of the Mississippi with the Ohio at Cairo, Illinois. However, no releases are presently made from the main stem Missouri River reservoirs to

meet demands anywhere on the Mississippi River for navigation water, municipal and industrial water, or other water demands, nor is flood control storage maintained in main stem reservoirs specifically for flood control on the Mississippi River.

In general, the hydrology of the Upper Mississippi and Missouri River basins are fairly similar. Historical periods of flooding on the Missouri have tended to coincide with flood periods on the Mississippi. Likewise, drought periods generally extend over both basins simultaneously. Therefore, regulation of the Missouri River system for demands and needs in the Missouri River Basin generally coincides with the demands and needs on the Mississippi River Basin.

Investigations are presently underway by the Missouri River Division of the U.S. Army Corps of Engineers and three other Corps divisions (Ohio River, Lower Mississippi River Valley, and Southwest divisions) concerning the possible operation of reservoirs in these major river basins to provide benefits on the Mississippi River. The investigation presently underway by the Missouri River Division concerns possible operation of Missouri River main stem reservoirs to meet water demands on the main stem Mississippi. The study has been completed, but was not available for review in time for this report.

Analysis by the Corps of Engineers indicates that Missouri River reservoir regulation has significant effects on Mississippi River flows. Table II-3 reproduces results from Corps analyses which demonstrate that for the period 1968-1980, Missouri River reservoir regulation generally increased low flows on the Mississippi during summer months and decreased discharge during spring and early summer.

Navigation water demand on the Mississippi River has the potential to substantially affect demand on the Missouri because of the greater tonnage transported on the Mississippi as compared to the Missouri. In recent years, more than 50 million tons of freight are transported on the Mississippi in an average year, versus approximately 3 million tons on the Missouri. Because of the greater tonnage on the Mississippi River, navigation benefits on the Mississippi resulting from Missouri main stem reservoir releases could be substantial. The previously mentioned study by the Missouri River Division is analyzing this question.

It appears, however, that Congressional action would be required to change operating policies of the main stem reservoirs to provide for releases for benefits on the Mississippi River. There would probably be major opposition to changing the main stem reservoir operating policies

TABLE II-3 DISCHARGE OF THE MISSISSIPPI RIVER AT ST. LOUIS WITH AND WITHOUT MISSOURI RIVER RESERVOIR REGULATION
(Values in 1,000 cfs)

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
1968	99.8[1]	151.0	110.3	170.0	185.6	191.1	214.5	174.8	115.1	148.6	166.7	132.0
	90.4[2]	163.4	119.6	168.0	176.6	212.2	269.9	164.7	108.2	140.3	156.4	126.7
1969	176.9	222.1	234.8	421.9	354.4	277.6	461.3	173.0	150.3	235.4	137.6	97.51
	172.0	220.0	239.2	503.7	370.7	301.8	504.1	154.3	106.3	201.1	113.5	88.6
1970	74.9	101.5	151.2	275.9	369.1	332.1	117.4	150.8	224.0	218.5	203.0	144.6
	69.8	95.0	149.5	280.6	401.1	393.5	187.6	128.9	190.0	196.2	180.7	136.5
1971	112.5	179.9	295.0	248.4	205.9	207.7	156.8	101.8	92.2	102.4	145.2	176.0
	107.6	179.0	330.4	284.9	208.6	243.8	205.4	91.4	58.7	78.3	119.0	161.7
1972	111.1	88.6	185.3	262.3	321.0	186.3	155.0	212.0	201.3	205.5	293.9	166.2
	102.0	83.3	225.8	303.5	325.1	228.4	189.9	191.4	175.0	174.4	269.4	159.8
1973	307.8	299.1	521.8	692.5	584.5	371.6	218.7	167.0	157.2	352.1	219.8	251.2
	303.7	298.4	535.8	696.9	593.5	396.4	236.0	146.9	139.9	347.7	207.5	251.5
1974	251.3	301.4	330.3	288.9	386.8	440.7	233.2	126.8	111.0	92.4	165.7	120.6
	247.2	306.7	335.5	292.1	391.7	472.2	295.9	114.3	93.1	71.5	151.8	120.6
1975	140.1	208.9	259.5	327.6	348.6	263.1	211.5	128.4	151.0	117.7	131.0	149.5
	132.2	200.9	259.8	339.3	415.2	319.8	299.2	121.4	106.3	73.7	90.0	134.8
1976	92.1	134.6	267.8	286.5	273.7	141.4	107.1	78.2	65.4	70.3	70.1	60.4
	90.7	134.9	267.2	296.1	273.3	190.1	156.5	74.1	43.3	50.5	50.1	44.5
1977	48.1	73.8	117.4	125.2	125.2	117.9	122.5	117.6	221.6	215.5	229.8	139.5
	40.8	68.3	125.9	123.6	120.8	114.9	120.2	88.9	200.0	202.0	215.4	135.3
1978	106.6	75.6	287.8	422.0	355.5	210.9	280.4	158.7	188.7	138.1	136.9	110.3
	102.9	71.1	309.7	557.4	384.3	280.4	239.2	149.1	156.5	111.7	100.1	91.0
1979	74.0	126.1	425.0	541.3	388.7	231.4	204.8	187.8	169.0	101.5	149.6	126.2
	66.0	115.4	434.4	607.3	430.1	250.9	222.4	166.7	148.6	75.8	129.4	111.6
1980	105.1	101.8	172.6	275.3	133.4	243.1	108.3					
	95.2	91.6	172.5	277.0	130.2	265.6	136.2					

[1] With Missouri River reservoir regulation.

[2] Without Missouri River reservoir regulation.

Source: Missouri River Division, U.S. Army Corps of Engineers, "Missouri River Contributions During Periods of Low Flow on the Mississippi River", Phase I Report, August, 1981.

in order to provide benefits on the Mississippi, because there appears to be limited "excess water" on the Missouri at present.

TRENDS IN WATER USES IN THE MISSOURI RIVER BASIN

General

Human uses of water resources fall under two categories: those uses that result in depletions of water, and those uses which do not. In the Missouri River Basin, considerable quantities of water are diverted (or withdrawn) from surface water and groundwater sources for various uses. There are return flows from most of these uses. The difference between the diversions (withdrawals) and the return flows is the consumptive use of the water. Consumptive use and other incidental losses are termed "depletion."

Of primary interest in this study are depletive water uses which reduce the upstream or downstream availability of water for the economic uses that may be made from the Missouri River system. The primary concern to Montana is not only the depletions that can occur in Montana upstream of the main stem reservoir system, but also the depletions of water from the main stem reservoir system and downstream tributaries that can also economically affect downstream uses. Depletive uses which could be affected include irrigation, municipal, industrial, and production of energy. Non-depletive water uses include generation of hydroelectric power at the main stem reservoirs, instream navigation, and water quality maintenance of the main stem Missouri River below the reservoir system.

Overall trends in water use can be illustrated by the estimated total depletions from the Missouri River system above Sioux City, Iowa, and the total depletions in the river basin above the mouth of the river near St. Louis, Missiouri. Such estimates have been developed by the Missouri River Basin Commission (MRBC) and are given in Table II-4 to illustrate the general trend in basinwide water use.

It should be noted that the 1975 depletions had formerly been estimated by the Missouri River Basin Commission to be the 1970 level of depletions. Their determination, made in the mid-1960's, necessarily involved a projection of several years' development. Some state and federal water planners in the basin believe that 1970 depletions were over-estimated and that the data are more representative of 1975 conditions. This report uses the 1970 data as the 1975 conditions.

Table II-5 shows geographical distribution of depletions by type of water use. It can be seen that the distribution of depletions between

TABLE II-4 TREND IN DEPLETION, MISSOURI RIVER BASIN

Year	Depletions Above Sioux City, Iowa	Depletions Between Sioux City, Iowa, and Mouth	Total Depletions in Basin
	(Values in million acre-feet per year)		
1910	2.7	0.3	3.0
1949	3.8	3.1	6.9
1975	6.5	5.2	11.7

Source: MRBC, 1969

TABLE II-5 TYPE OF MISSOURI RIVER BASIN DEPLETIONS

	1975 Depletions Above Sioux City, Iowa	1975 Depletions Between Sioux City and the Mouth
	(Values in million acre-feet per year)	
Irrigation	65%	75%
Reservoir Evaporation	29%	21%
All other uses	6%	4%

the upper and lower basins is quite similar. In other words, although there is a sizable amount of evaporation from the major main stem reservoirs in the upper basin, the construction of impoundments in the lower basin has also resulted in depletion of a considerable amount of water. Irrigation depletion in the upper and lower basins is of a similar magnitude, as is the depletion resulting from other uses.

Table II-6 illustrates the rate of growth of the water uses in the upstream and downstream areas of the Missouri River and shows a significant difference before 1949, but similar growth rate between the upper and lower portions after 1949. A considerable portion of the new upper basin depletion resulted from the evaporation from the main stem reservoirs.

To estimate recent trends in water depletions, an analysis was made of new data collected by the Missouri Basin States Association (MBSA), successor to the Missouri River Basin Commission. MBSA is conducting an indepth study of the 1944 through 1978 water uses in order to provide better estimates of the depleted level of streamflows of the Missouri River and its tributaries. The MBSA Missouri River Basin Hydrology Study will not be completed until after this study; however, certain data have been made available that can be utilized to indicate trends, demands, uses, and depletions of the Missouri River and its tributaries. The water use trends analysis is presented by functional type of use.

All of the data have been presented as closely as possible to subbasins of the Missouri River shown on Figure II-2. This was done to aid analysis of projections of future depletions for the hydrology studies described in Chaper III.

Trends In Irrigation

Specific data on the trends in irrigation depletions throughout the Missouri River Basin are not readily available and primary research on this matter is not within the scope of this report. The MBSA study, however, has progressed to the point that data are available on irrigated acreages.

Historically, irrigation has been the largest use and depletion of water in the Missouri River Basin. Sources of water for irrigation include surface water from Missouri River tributaries, a minor amount of main stem Missouri River water, and groundwater. Some of the groundwater withdrawals are from nontributary aquifers and do not deplete surface streams. Other withdrawals of groundwater have a related depletion of

TABLE II-6 RATE OF INCREASE IN MISSOURI RIVER BASIN DEPLETIONS

Period	Depletions Above Sioux City, Iowa	Depletions Below Sioux City, Iowa
1910-1949	41%	933%
1949-1975	71%	68%

Source: MRBC, 1969

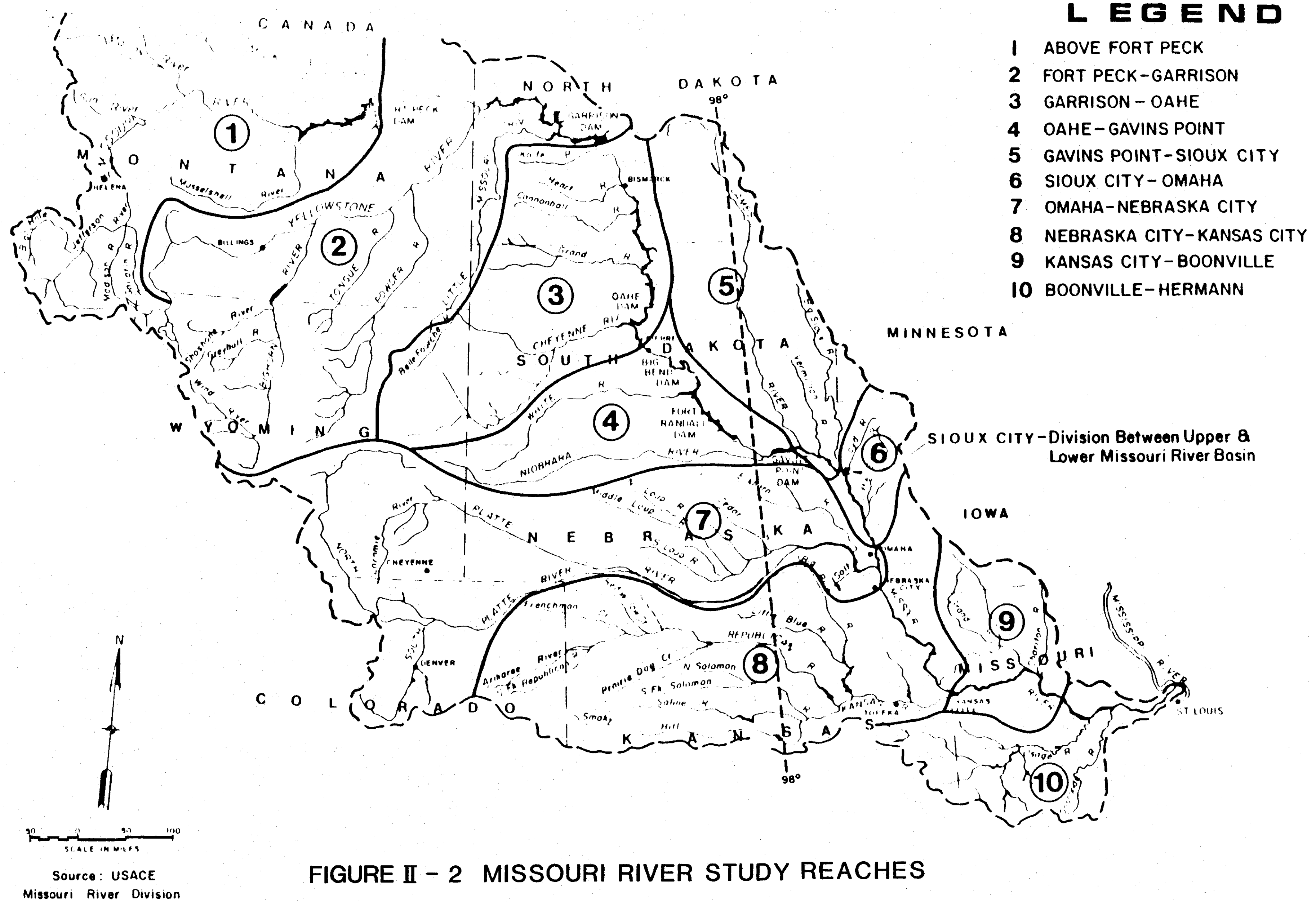

FIGURE II - 2 MISSOURI RIVER STUDY REACHES

streamflow which may lag several months or years after the actual use, depending on factors such as distance from a river and the characteristics of the aquifer involved. Data on the number of acres irrigated by groundwater are not available. Thus, because of the lagged effect of some groundwater sources and the use of other nontributary groundwater sources, irrigated acreages do not correlate directly with streamflow depletions. Nevertheless, the acreages are a good indication of the trend in water use for the largest consumer of water in the Missouri River Basin.

Table II-7A shows the Missouri River Basin irrigated acres for the years 1949 through 1978. These data are summarized from the MBSA data and are intended to show trends. The increase in total irrigated acreage in the Missouri River Basin from 1949 to 1969 of 5,523,000 acres to 8,647,000 acres is about a 3 percent average annual growth rate. During that time, the amount of irrigation downstream of Montana increased from 48 percent to 63 percent of the entire basin.

From 1969 to 1978 the average annual growth rate of irrigation in the basin was almost 6 percent. The 1969 to 1978 data also show a large jump in irrigated acreage downstream of Montana. It is believed that much of this jump is due in part to reporting and accounting procedures, but it is also due in part to the accelerated installation of sprinkler irrigation systems, particularly in areas with abundant groundwater supplies.

Table II-7B shows the same data in Table II-7A but as a percentage of the subarea to the total basin. Irrigation in North and South Dakota nearly doubled between 1949 and 1969 and experienced a threefold increase in the nine years from 1969 to 1978. This occurred even with delay of the Garrison and Oahe units--U.S. Bureau of Reclamation projects that were to divert water from the Missouri River easterly into the James River Basin and other areas. The Garrison project includes exportation of water from the Missouri River Basin.

Below Sioux City, irrigation also doubled between 1949 and 1969. It nearly doubled again between 1969 and 1978. The largest absolute gain occurred in Nebraska, which added over 3 million acres during that period. A large percentage of the water supply for this development has come from withdrawals of groundwater.

The data in Tables II-7A and II-7B indicate a decline in irrigation in Montana. This may be a reporting problem or a problem related to statistical determinations. Montana Department of Natural Resources and Conservation staff report a one percent average annual growth in irrigation between 1969 and 1978 (DNRC, Smith, 1981). The DNRC has been active

TABLE II-7A MISSOURI RIVER BASIN IRRIGATED ACREAGES

Subarea[1]	1949	1959	1969	1978
	1,000 Acres			
Upper Missouri & Yellowstone				
Wyoming[2]	697	717	746	877
Montana	2,175	2,369	2,420	2,158
Subtotal	2,872	3,086	3,166	3,035
Percent of Total	52	42	37	23
Yellowstone River Confluence to Sioux City				
North Dakota	36	17	57	153
South Dakota	78	115	148	461
Minnesota	-	-	-	4
Subtotal	114	132	205	608
Percent of Total	2	2	2	5
Sioux City to Mouth				
Wyoming[2]	548	563	586	689
Colorado	1,071	1,098	1,221	1,558
Nebraska	876	2,078	2,857	5,938
Kansas	41	277	582	1,073
Iowa	-	14	16	228
Missouri	1	11	14	103
Subtotal	2,537	4,041	5,276	9,589
Percent of Total	46	56	61	72
TOTAL ACREAGE	5,523	7,259	8,647	13,242

[1]State data are disaggregated approximately into subbasins.

[2]Division of Yellowstone and Platte River basins is estimated by Wright Water Engineers.

Source: Missouri River Basin Commission (MRBC), August, 1981.

TABLE II-7B MISSOURI RIVER BASIN IRRIGATED ACREAGE

Ratio of Subarea to Total Irrigated Acreage in Basin

(Acreage values in 1,000's)

Subarea	1949	1959	1969	1978
Montana	2,175	2,369	2,420	2,158
	39.4%	32.6%	28.0%	16.3%
Wyoming	1,245	1,280	1,332	1,566
	22.5%	17.6%	15.4%	11.8%
North Dakota	36	17	57	153
	0.6%	0.2%	0.7%	1.2%
South Dakota	78	115	148	461
	1.4%	1.6%	1.7%	3.5%
Colorado	1,071	1,098	1,221	1,558
	19.4%	15.1%	14.1%	11.8%
Nebraska	876	2,078	2,857	5,938
	15.9%	28.6%	33.0%	44.8%
Kansas	41	277	582	1,073
	0.7%	3.8%	6.7%	8.1%
Iowa, Missouri,	1	25	30	335
and Minnesota	0.1%	0.5%	0.4%	2.5%
Totals	5,523	7,259	8,647	13,242
	100%	100%	100%	100%

in determining the potential for irrigation in the state, and Table II-8 presents the most recent Montana figures on irrigated and irrigable lands in the state. Considerable acreage for potential new irrigation has been identified.

In summary, irrigation throughout the basin, exclusive of Nebraska, has increased between 1969 and 1978 on an average of approximately 3 percent per year, or about 168,000 acres annually. The average annual growth over the longer period (1949-1978), exclusive of Nebraska, is 2 percent, or 91,000 acres annually. Since 1969, Nebraska has added an average of 342,000 acres per year to the total irrigated acreage in the Missouri River Basin. Over the longer period from 1949, it has added an average of 174,500 acres annually. However, groundwater withdrawals are the source for most of the additional acreage in Nebraska. The future supplemental surface water requirement for acreage presently irrigated by the Ogallala aquifer is a potential conflicting water use which will be discussed in Chapter III.

Trends in Water Use for Energy (excluding hydropower)

Potential energy related water use has received considerable attention in recent years, particularly that associated with the potential coal development in Wyoming, Montana, and the Dakotas. The growing demand for electric energy has resulted in the construction of many thermal electric power generating plants in the Missouri River Basin. In addition, the energy extracting and processing industries associated with oil and gas, uranium, and coal have been important in meeting the demands within and outside of the Missouri River Basin.

Table II-9 and II-10 summarize information from the MBSA study on surface water uses for energy extracting, processing, and generating purposes. Table II-9 summarizes the surface water withdrawals, and Table II-10 summarizes the depletion of water in the energy industry. Data are summarized by water use and by years for each reach of the Missouri River from the headwaters to the mouth and its tributaries. These reaches are shown in Figure II-2.

Except for the Kansas River tributaries, water use for energy extracting and processing purposes has not changed significantly over the years on the tributaries or the main stem Missouri River. On the other hand, the withdrawals and depletions of water for thermal electric power generation have increased many fold on both the tributaries and the main stem Missouri River. A significant portion of the increase has been for flow-through cooling for thermal electric power. This basinwide flow-through cooling generally has a consumption rate of about 10 percent of the withdrawal.

TABLE II-8 MONTANA MISSOURI RIVER BASIN IRRIGATION POTENTIAL

(Acres)

Subbasin	Irrigated	Irrigable[1]
Missouri River		
Upper Missouri Tributaries	578,936	758,293
Missouri - Smith	143,136	398,943
Missouri - Sun - Marias	355,928	1,587,625
Missouri - Musselshell	141,900	1,066,642
Milk	218,018	1,582,251
Missouri - Fort Peck	72,689	1,589,939
Subtotal	1,510,607	6,983,693
Yellowstone River		
Upper Yellowstone	270,104	261,658
Middle Yellowstone	246,771	894,632
Lower Yellowstone	132,063	1,023,291
Subtotal	648,938	2,179,581
Little Missouri[2]	42,586	167,661
TOTAL	2,202,131	9,330,935

[1] Irrigable designation includes land classes 1, 2, and 3.

[2] Includes Belle Fourche, 0 irrigated, 507 irrigable.

Source: Personal communication with Glenn R. Smith, Montana Department of Natural Resources and Conservation.

TABLE II-9 TRENDS IN MISSOURI RIVER BASIN SURFACE WATER USES FOR ENERGY EXTRACTING, PROCESSING, AND GENERATION PURPOSES - WITHDRAWALS

Water Withdrawals (1,000 Acre-Feet Per Year)

River Reach	Use[1]	1940	1950	Year 1960	1970	1978
1. Above Fort Peck Dam			None Reported			
2. Fort Peck to Garrison Dam						
Yellowstone R. Basin	Ext, Proc	0.9	0.9	0.9	0.9	0.9
	Gen.				92.0	99.4
Garrison Reservoir	Ext, Proc			0.3	0.3	0.3
3. Garrison to Oahe Dam						
Western Dakota Tribs	Ext, Proc					0.2
	Gen.	1.2	1.3	1.5	1.5	1.4
Oahe Reservoir	Ext, Proc			2.7	2.7	2.7
	Gen.			56.0	504.0	1782.1
4. Oahe to Big Bend Dam			None Reported			
5. Big Bend to Ft. Randall Dam			None Reported			
6. Ft. Randall to Gavins Point Dam			None Reported			
7. Gavins Point to Sioux City						
Missouri River	Ext, Proc				0.1	negl.
8. Sioux City to Omaha						
Tributaries	Ext, Proc	4.7	4.7	4.7	4.7	4.7
9. Omaha to Nebraska City						
Tributaries (Platte)	Ext, Proc	3.7	4.9	4.6	4.7	6.0
	Gen.	0.7	2.3	300.5	930.2	911.6
Missouri River	Gen.			35.4	847.0	2042.0
10. Nebraska City to Kansas City						
Tributaries	Ext, Proc	46.1	46.1	46.3	17.2	25.3
	Gen.	45.0	56.9	64.0	35.7	30.5
Missouri River	Ext, Proc	0.7	1.1	1.2	1.4	1.4
	Gen.	3.2	78.8	92.3	234.4	866.9
11. Kansas City to Boonville						
Tributaries	Ext, Proc	1.1	1.8	1.8	2.1	2.1
	Gen.	7.9	7.9	7.9	280.5	280.5
Missouri River	Ext, Proc	2.0	2.7	2.8	3.1	3.4
	Gen.	38.0	38.6	833.4	835.0	835.0
12. Boonville to Hermann						
Tributaries	Ext, Proc	5.0	7.3	7.5	8.4	8.7
	Gen.		0.2	10.1	10.1	10.1
Missouri River	Ext, Proc	3.0	4.2	4.5	5.1	5.5
	Gen.	56.2	65.2	1225.0	1225.0	1215.6
Totals: Tributaries	Ext, Proc	61.5	65.7	65.8	38.0	48.7
	Gen.	54.8	68.6	384.0	1350.0	1333.5
Missouri River	Ext, Proc	5.7	8.0	11.2	12.7	13.3
	Gen.	97.4	173.6	2242.4	3645.4	6741.6
GRAND TOTALS		219.4	315.9	2703.4	5046.1	8137.1

[1]"Ext" means Extraction
"Proc" means Processing
"Gen" means Generation of Electricity

Source: Missouri Basin States Association, M&I Water Use Work Group, Self Supplied Energy by Node Basin (Data submitted by states), October 1, 1981.

TABLE II-10 TRENDS IN MISSOURI RIVER BASIN SURFACE WATER USES FOR ENERGY EXTRACTING, PROCESSING, AND GENERATION PURPOSES - DEPLETIONS

Depletions (1,000 Acre-Feet Per Year)

River Reach	Use[1]	1940	1950	Year 1960	1970	1978
1. Above Fort Peck Dam				None Reported		
2. Fort Peck to Garrison Dam						
Yellowstone R. Basin	Ext, Proc	0.9	0.9	0.9	0.9	0.9
	Gen.				1.0	8.4
Garrison Reservoir	Ext, Proc			0.3	0.3	0.3
3. Garrison to Oahe Dam						
Western Dakota Tribs	Ext, Proc					0.2
	Gen.	1.0	1.0	0.3	0.3	0.6
Oahe Reservoir	Ext, Proc			0.2	0.2	0.1
	Gen.			0.2	15.4	27.9
4. Oahe to Big Bend Dam				None Reported		
5. Big Bend to Ft. Randall Dam				None Reported		
6. Ft. Randall to Gavins Point Dam				None Reported		
7. Gavins Point to Sioux City						
Missouri River	Ext, Proc				0.1	negl.
8. Sioux City to Omaha						
Tributaries	Ext, Proc	negl.	negl.	negl.	negl.	negl.
9. Omaha to Nebraska City						
Tributaries	Ext, Proc	3.7	4.9	4.6	4.7	6.8
	Gen.	0.7	2.3	36.9	85.6	85.6
Missouri River	Gen.			3.5	84.7	204.2
10. Nebraska City to Kansas City						
Tributaries	Ext, Proc	0.3	4.7	4.8	0.2	0.1
	Gen.	19.5	22.4	15.8	4.7	2.6
Missouri River	Ext, Proc	0.2	0.4	0.5	0.6	0.6
	Gen.	0.3	0.5	0.5	16.0	28.1
11. Kansas City to Boonville						
Tributaries	Ext, Proc	0.4	0.6	0.6	0.6	0.6
	Gen.	5.3	5.3	5.3	19.1	19.1
Missouri River	Ext, Proc	0.7	0.8	0.9	1.0	1.1
	Gen.	0.2	0.6	6.3	5.5	5.5
12. Boonville to Hermann						
Tributaries	Ext, Proc	1.8	2.6	2.6	3.1	2.9
	Gen.	0	0	0.1	7.1	7.1
Missouri River	Ext, Proc	0.8	1.1	1.3	1.6	1.7
	Gen.	8.7	8.7	39.1	39.1	38.5
Totals: Tributaries	Ext, Proc	7.1	13.7	13.5	9.5	11.5
	Gen.	26.5	31.0	58.4	117.8	123.4
Missouri River	Ext, Proc	1.7	2.3	3.2	3.8	3.8
	Gen.	9.2	9.8	49.6	160.7	304.2
GRAND TOTALS		44.5	56.8	124.7	291.8	442.9

[1]"Ext" means Extraction
"Proc" means Processing
"Gen" means Generation of Electricity

Source: Missouri Basin States Association, M & I Water Use Work Group, Self Supplied Energy Water Use by Node Basin (Data submitted by states), October 1, 1981.

The recent trend in water cooling for thermal electric plants is towards cooling towers rather than flow-through cooling. In the upstream areas, limited water supplies and water discharge temperature constraints are the reasons for the trend. Cooling towers may also come into more predominant use even on large tributaries and perhaps the main stem because of the water quality constraints. The water withdrawal for cooling towers is much less than in flow-through cooling. Normally, water used in cooling towers is 100 percent consumptive in order to avoid discharges into streams.

Water withdrawals for generation of electric energy currently total over 8 million acre-feet per year in the Missouri River Basin system; the basin-wide depletion for electric generation totals only about 427,600 acre-feet per year.

Lower water diversions for synthetic fuel plants are also fostered by scarcity of water and water pollution control regulations. Planned synthetic fuel plants will recycle plant waste water instead of treating it to levels necessary for discharge into surface streams.

From 1950 to 1978, state-reported withdrawals of water for all energy purposes in the Missouri River Basin increased by about 3600 percent, from 219,400 acre-feet per year to 8,137,000 acre-feet per year. Depletions in the Missouri River Basin for energy purposes have increased only about 900 percent in the same period, from 44,500 acre-feet per year to 442,900 acre-feet per year.

Energy generation has developed much faster in the downstream states and in the more populous areas than in the upper Missouri and Yellowstone River basins. This is due in large part to the long distance between the upstream area and the population-demand centers. However, the extraction and processing of coal and uranium for shipment to more populous areas has developed quite extensively in the upstream areas. Little surface water is currently used in these processes.

Trends in Water Use for Hydroelectric Power

Most large scale electric power planning in the United States and part of Canada is conducted by the National Electric Reliability Council (NERC). NERC is divided into regional reliability councils, and the Missouri River Basin is in a portion of three of the regions. The recent

trend in installed electric generation capacity in the Missouri River Basin is shown in Table II-11:

TABLE II-11 RECENT TREND IN INSTALLED ELECTRIC GENERATION CAPACITY IN MISSOURI RIVER BASIN BY TYPE

	1975		1979	
	No. of Plants	Capacity (in megawatts)	No. of Plants	Capacity (in megawatts)
Conventional hydropower	58	3,368	56	3,787
Pump storage hydropower	1	300	2	408
Nonhydro-power	340	19,943	346	26,773
Total	399	23,611	404	30,968

Source: MRBC Energy and Water Committee Report, 1981

In the upper Missouri and Yellowstone River basins in Wyoming and Montana, the installed capacity of hydroelectric plants totalled about 720 mw in 1979 (or 2 percent of the basin capacity). On the main stem of the Missouri River in North Dakota and South Dakota, a total of 1,913 mw of capacity has been installed in the Corps of Engineers dams. The 1980 revenue from power generation from main stem reservoirs was $77 million.

As shown above, recent growth in electric generating capacity has been primarily associated with plants fired by fossil fuels, predominantly coal. This trend has been projected to be followed for future additions to the generating capacity primarily because the demands for new electric energy outstrip the potential capacity of identified new hydroelectric power sites. Also new hydropower sites are associated with dam construction, which has been opposed in recent years. Possible exceptions to such opposition are peaking power plants developed by pump storage units constructed in conjunction with existing dams and reservoirs.

Construction of the Pick-Sloan Missouri Basin power plants helped promote the use of electric energy in the region and helped establish a basis for the reliability of and dependence on electric energy. The capacity of that system is now essentially being fully utilized. Municipalities, rural electric associations, and their transmission and generation associations are looking for new thermal electric power plants to meet the increasing needs within the service areas.

Although there may be new hydropower plants constructed, the recent trend of providing base loads from thermal electric plants should continue in the future.

Trends in Municipal and Industrial (Urban) Water Uses

Municipal and industrial (M & I), or urban, water use can be indicated by the population in the various portions of the Missouri River Basin. Table II-12 summarizes by river reach (see Figure II-2) MBSA data about the urban population using surface water, and also indicates trends. Table II-13 shows the average annual growth rate of the population using surface water in four periods for the area above Garrison Reservoir, for all the tributaries, for the main stem of the Missouri River, and for the total basin. The rates of population growth in the main steam and the tributary areas above Garrison Reservoir are below the average for the basin.

Altogether, the urban population using surface water from the Missouri River system in 1978 was 5.8 million. That represents a water withdrawal of approximately 1.2 million acre-feet per year, resulting in a depletion of nearly 0.6 million acre-feet per year, using national average municipal water use statistics as an indicator.

TABLE II-12 URBAN POPULATION USING SURFACE WATER

River Reach	Population, 1,000's 1950	1960	1970	1975	1978
1. Above Fort Peck Dam	96.6	128.3	137.6	138.1	138.4
2. Ft. Peck to Garrison Dam					
Missouri R. Montana[1]	2.6	3.6	3.1	3.1	3.1
Yellowstone River	98.1	134.7	146.8	156.0	161.3
Subtotal (Above Garrison)	197.3	266.6	287.5	297.2	302.8
Garrison Reservoir	7.4	11.9	11.3	12.3	12.9
3. Garrison to Oahe Dam					
Tributaries	57.4	83.8	90.2	96.3	99.9
Missouri River	11.0	14.9	15.6	17.7	18.9
4. Oahe to Big Bend Dam					
Tributaries	18.6	27.7	34.7	39.6	42.5
Missouri River	5.7	10.1	9.7	10.8	11.5
5. Big Bend to Ft. Randall Dam					
Tributaries	4.7	5.1	5.9	5.9	5.9
Missouri River	3.3	6.3	6.4	3.6	3.5
6. Ft. Randall to Gavins Point					
Tributaries	10.6	10.7	9.5	11.1	12.1
7. Gavins Point to Sioux City					
Tributaries	162.3	194.8	212.7	219.3	223.3
Missouri River	13.0	15.3	21.0	21.3	21.5
8. Sioux City to Omaha					
Tributaries	15.2	19.3	20.6	21.6	22.3
Missouri River	114.8	126.7	132.4	132.4	132.4
9. Omaha to Nebraska City					
Tributaries	840.6	1215.1	1616.1	1783.9	1895.9
Missouri River	309.3	377.1	445.6	426.7	415.3
10. Nebraska City to Kansas City					
Tributaries	307.9	399.2	427.5	432.2	439.3
Missouri River	282.0	285.2	347.9	362.4	371.0
11. Kansas City to Boonville					
Tributaries	52.0	53.4	58.6	60.1	60.9
Missouri River	586.1	688.1	825.2	815.9	810.4
12. Boonville to Hermann					
Tributaries	146.2[1]	190.7	242.0	254.2	261.5
Missouri River	977.4	927.7	865.2	780.0	733.0
Totals: Tributaries	1812.7	2466.4	3005.6	3221.4	3366.4
Missouri River	2310.7	2463.3	2676.3	2583.1	2530.4
GRAND TOTALS	4123.4	4929.7	5685.9	5804.5	5896.8

[1]Included with tributary population.

Source: Missouri Basin States Association, January 26, 1981.

Trends in Rural Water Uses

MBSA data are also available for the population in rural areas and towns of less than 2,500 in the basin that use surface water. These data are summarized by river reach (see Figure II-2) in Table II-14. It can be seen that some areas of the basin have had declining rural populations, but in general the total rural population using surface water has remained about the same.

TABLE II-13 AVERAGE ANNUAL GROWTH RATE OF POPULATION USING SURFACE WATER FOR SELECTED PORTIONS OF THE MISSOURI RIVER BASIN

	1950-1960	1960-1970	1970-1975	1975-1978
Wyoming & Montana (above Garrison Reservoir)	3.5%	0.7%	0.7%	0.6%
All tributaries	3.6%	2.2%	1.4%	1.5%
Main stem Missouri River	0.7%	0.9%	<0.7%>	<0.7%>
Basin Total	2.0%	1.5%	0.4%	0.7%

The distribution of rural population using surface water has remained about 70 percent in the tributary areas and about 30 percent in areas of the basin along the tributaries.

TABLE II-14 - RURAL POPULATION USING SURFACE WATER

River Reach	Population, 1,000's 1950	1960	1970	1975	1978
1. Above Fort Peck Dam	137.0	142.0	129.9	134.8	137.8
2. Ft. Peck to Garrison					
Missouri R.-Montana	27.8	29.6	25.0	24.8	24.6
Yellowstone River	137.1	132.3	118.9	132.9	141.3
Subtotal (above Garrison)	301.9	303.9	273.8	292.5	303.7
Garrison Reservoir	44.9	44.7	36.8	38.1	38.8
3. Garrison to Oahe Dam					
Tributaries	114.9	114.4	100.6	107.5	111.7
Missouri River	80.7	69.0	60.1	59.3	58.7
4. Oahe to Big Bend Dam					
Tributaries	6.4	7.0	6.5	7.2	7.6
Missouri River	7.4	7.2	6.4	6.4	6.4
5. Big Bend to Ft. Randall					
Tributaries	27.6	26.2	24.8	26.5	27.5
Missouri River	33.3	27.0	24.0	23.0	22.4
6. Ft. Randall to Gavins Point					
Tributaries	32.8	29.3	25.7	24.8	24.3
7. Gavins Pt. to Sioux City					
Tributaries	299.1	285.6	256.6	252.1	249.4
Missouri River	90.7	82.9	74.6	74.1	73.8
8. Sioux City to Omaha					
Tributaries	85.2	79.4	72.3	72.2	72.1
Missouri River	124.2	115.7	109.9	115.0	118.1
9. Omaha to Nebraska City					
Tributaries	648.8	676.2	821.8	885.4	923.7
Missouri River	47.5	60.9	72.4	93.1	105.5
10. Nebraska City to Kansas City					
Tributaries	699.8	640.3	595.2	679.3	596.8
Missouri River	251.5	263.6	196.7	198.2	199.1
11. Kansas City to Boonville					
Tributaries	172.7	141.9	124.6	125.6	126.2
Missouri River	212.2	229.5	193.8	207.0	214.9
12. Boonville to Hermann					
Tributaries	338.5	345.2	350.9	381.6	399.9
Missouri River	144.4	152.2	166.5	194.0	210.4
Totals: Tributaries	2611.5	2528.7	2541.9	2656.5	2725.3
Missouri River	1152.9	1173.5	1052.1	1123.2	1165.9
GRAND TOTAL	3764.4	3702.2	3594.0	3779.7	3891.2

Source: Missouri Basin States Association, January 26, 1981.

Trends in Navigation

The existing Missouri River navigation facility provides for a continuous channel 9 feet deep and 300 feet wide from Sioux City, Iowa, to the mouth.

Commercial navigation on the Missouri River from Sioux City, Iowa, to the mouth is dependent upon low flow supplementation from the main stem reservoir system. Navigation is limited to the ice-free season. Opening and closing dates of a normal 8-month navigation season are as follows:

	Opening Date	Closing Date
Sioux City	March 23	November 22
Omaha	March 25	November 24
Kansas City	March 28	November 27
The Mouth	April 1	December 1

In some years, ice conditions will delay the opening of the season and in others may force an early shutdown.

Commodity movements ranged from 100,000 to 400,000 tons per year during the 1946 to 1957 period. There followed a rapid expansion of commodity movements, and in the years 1962 to 1975, commodity shipments ranged between 1.8 million tons and 2.8 million tons per year. Since 1975, shipments have increased to a range of between 3.1 to 3.3 million tons during the 8-month navigation season. The average length of haul on the waterway for Missouri River commercial traffic is 1,275 miles.

The 1980 value of this navigation on the Missouri River has been established by the Missouri River Division of the Corps of Engineers to be approximately $6.80 per ton per year (Corps of Engineers, December, 1980). Based on these data in 1980, commercial navigation on the Missouri produced approximately $20 million in benefits for 3 million tons of commodity movements.

The growth of commercial shipments on the Missouri River navigation channel will be affected by future energy costs. The projected tonnage has been estimated to be 4.1 to 4.7 million tons by 1990 and 4.8 to 5.7 million tons by 2000, with a leveling-off at about these same levels of navigation by the year 2030.

The ability to meet the projected navigation shipments can be affected by future upstream depletions of water. As the future upstream depletions rise above the current level of depletions, the navigation season will have to be cut from 8 months to as few as 4 months per year during low flow periods when the Corps of Engineers main stem reservoir operations must be limited to provide water for other purposes. Under some scenarios of future upstream depletions, it will be necessary to curtail navigation altogether during some years. (This subject is described in more detail in the following chapter of this report.)

Operation studies of the main stem reservoir system conducted over the last dozen years have consistently shown that at some point in the future, upstream depletions coupled with drought conditions during low flow periods will force curtailment of navigation on the middle and lower Missouri River. This factor sets the scene for upstream-downstream water use conflict.

CURRENT PLANS FOR INTERBASIN AND INTRABASIN DIVERSIONS

Diversions of water from the Missouri River and its tributaries to other river basins would result in a total depletion to the Missouri River system. The Garrison Irrigation Project in North Dakota includes a diversion of water from the Missouri River into the Souris and Red River of the North river basins. Some of the planned project units lie in the James River Basin, where return flow would find its way back into the Missouri River; but these return flows are only a minor part of the total project diversion.

Originally, the Garrison Project was identified for irrigation water service for 1,007,000 acres. Diversion requirements from the Missouri River from Lake Sakakewea for the entire project were estimated to be 2,626,000 acre-feet per year, with James River return flows reaching the Missouri River amounting to 195,000 acre-feet per year. The Initial Stage Garrison Project diversion was estimated to be 871,000 acre-feet per year for 250,000 acres of irrigation, water quality control, municipal and industrial use, and fish and wildlife areas, with James River return flows of 5,000 acre-feet per year.

Lengthy legal battles over the National Environmental Policy Act (NEPA) and mitigation lands have stalled the project for several years. Canada also threatens legal action if any attempt is made to develop portions of the project tributary to Hudson Bay because of the concern about transfer of undesirable biota. The Bureau of Reclamation has proposed a reduced plan involving irrigation of only 96,300 acres, reducing the diversion requirements accordingly.

Intrabasin diversions (transbasin diversions between Missouri River tributary basins) are also depletive of water in the supply tributary and the Missouri River. Although from a macro view these could be considered redistribution of supply, interbasin diversions are often met with regional opposition. For example, Article X of the Yellowstone River Compact prohibits the diversion of water from the Yellowstone River Basin without the consent of the states of Montana, Wyoming, and North Dakota. This provision has precluded most serious planning of water systems to serve coal fields outside of the Yellowstone River Basin boundaries and has resulted in new legislation in Montana relating to approvals and in court challenges to Article X. The Montana legislature set up a process allowing DNRC to make decisions on interbasin transfers; however, any approvals before July 1, 1983, must be ratified by the legislature.

The Energy Transportation System Incorporated (ETSI) has negotiated a contract to purchase 50,000 acre-feet per year from Lake Oahe for its coal slurry pipeline from Wyoming to the Gulf Coast area. ETSI proposes to use 20,000 acre-feet annually for coal slurry and 30,000 acre-feet for unspecified uses. This will be an intrabasin diversion to Wyoming, then an interbasin diversion, or exportation of water, from the Missouri River Basin. South Dakota, in partnership with ETSI, proposes to divert an additional 6,750 acre-feet per year from Lake Oahe into the western Dakota tributaries area for supplying communities along the pipeline.

The Texas Eastern Pipeline Company is negotiating for a 20,000 acre-foot per year water supply from Oahe Reservoir for a coal slurry pipeline originating in the Powder River Basin of Montana.

Exxon proposed a pipeline from Lake Oahe to supply 600,000 acre-feet per year to the Powder River Basin for coal development and 1,100,000 acre-feet per year to western Colorado and Utah for oil shale development. The latter would be totally depletive to the Missouri River Basin.

The Powder River Pipeline Company is negotiating the use of the waste water effluent from Rapid City to slurry coal from the Powder River Basin in Montana to the Great Lakes region.

Within the past two years, six plans have proposed to use the remaining flows of the Platte River for irrigation. Four of the plans would involve intrabasin diversion to the Republican, Little Blue, and Big Blue River basins. The total quantity of water involved is 1,025,000 acre-feet per year. Such plans were envisioned in concept in the Missouri River Basin Framework Plan of 1971.

An analysis is currently under way by the U.S. Department of Commerce and other federal and state agencies concerning water resources management of the Ogallala Aquifer in the high plains area of Colorado, Nebraska, Kansas, Oklahoma, New Mexico, and Texas. The study is considering a proposed diversion of Missouri River water for restoring irrigation to 1977 levels in the high plains area currently dependent on the Ogallala aquifer. Under this proposal, additional new irrigation would not be implemented and water would only be diverted from the Missouri to maintain the 1977 irrigation level in the high plains area. The report and final recommendations were not available in time for this study.

Two possible sources of diversion from the Missouri River for water supply to the high plains area are being considered: (1) Fort Randall Reservoir and (2) the main stem of the Missouri River near St. Joseph, Missouri. The first alternative, with its source at Fort Randall, South Dakota, would transport water southward through Nebraska to terminal storage at Bonny Reservoir, Colorado. The second alternative, with its source in the Missouri near St. Joseph, Missouri, would have a route southwestward through Kansas to terminal storage on the Arkansas River near Dodge City, Kansas. Diversion from the Missouri River for the high plains area would presumably involve only surplus water. However, as noted elsewhere in this report, the existence of surplus water in the main stem Missouri River is questionable.

Initial studies concerning diversion of 2.4 million acre-feet per year and 5.26 million acre-feet per year from these points on the Missouri River have been completed by the Corps of Engineers. More recent analysis indicates that the actual amount of water required to restore irrigation to the 1977 level in the high plains study area would be approximately 4 million acre-feet per year.

Usable return flows from this potential diversion would be minimal since only a portion of the diverted water would be used for irrigation in the Missouri River Basin, with the remainder exported from the Missouri Basin to areas in Oklahoma, Texas, and other states. Some of the water would be used in the Smokey Hill and Republican River basins, which

would provide return flows to the Missouri River far downstream near Kansas City. Consequently, for practical purposes, diversion from the Missouri for restoring irrigation to areas in the high plains now dependent on the Ogallala aquifer would result in nearly total consumptive use of this water.

If this depletion took place, a substantial impact would result to the Missouri River basin water resources, particularly navigation. The results of operational studies conducted for this report are discussed in Chapters III and IV.

The extremely high cost of the proposed diversion from the Missouri Basin for restoring irrigation in the high plains area would make its implementation very unlikely without substantial federal subsidy. For example, the estimated cost (in July, 1981) for diverting approximately 4 million acre-feet annually of Missouri River water to the high plains area would range from approximately $11.2 to $17.5 billion dollars, depending on the length of the construction period. (Corps of Engineers, July 1981).

These costs include only capital costs for the major canal, pipelines, and pumping stations. Estimates do not include the cost for the significant distribution system beyond the main canal. The amortized first cost, including interest during construction, together with the cost of operation and maintenance (including energy for pumping) for just the main canal and pipelines, would push the cost of irrigation water to more than $300 per acre-foot. Corps of Engineers personnel indicate that when the additional cost for the secondary transportation system is included, water from the Missouri River transported to the high plains area for maintaining irrigation would cost more than $500 per acre-foot. The current value of an acre-foot of agricultural water is approximately $250 to $325[1]. Consequently, it is clear that without substantial government subsidy, such a project is not likely to be economically feasible within the near future.

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1 Values from a Wright Water Engineers' evaluation based on the capitalized value of gross crop production per acre-foot of irrigation water.

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CHAPTER III

Assessment Of Potential Interstate Water Use Conflicts

Assessment Procedures

The steps utilized in the assessment include the following:

1. Review of available information on past projections of Missouri River Basin water depletions.

2. Review of applicable literature on potential Missouri River Basin water depletion and on main stem reservoir operations. The review was directed towards establishing an understanding of the past water depletion projections and of the factors which affect the magnitude and timing of future water depletions.

   Numerous planning reports on the basin have been issued from such agencies as the Missouri River Basin Commission, the Bureau of Reclamation, the U.S. Army Corps of Engineers, the U.S. Department of Agriculture, several agencies in each of the ten states, private entities, and local governments. In keeping with the scope of this study, the documents review was confined to those types of reports which could readily be used to modify other projections.

   The list of selected references for Chapter II and III contains the documents utilized for review. It will be noted that many of the reports are multiagency "Level B" studies conducted under the guidelines of the U.S. Water Resources Council. Other reports are from state water planning efforts and U.S. Bureau of Reclamation project reports. The literature review not only encompassed data upon which to modify depletion projections, but also included data on the main stem reservoir operations.

3. Development of alternative (low, medium, high) future water depletion projections. Low, medium, and high projections are given by use (irrigation, energy, municipal and industrial, interbasin diversions and other) for four planning periods: 1975-1990, 1975-2000, 1975-2020, and 1975-2040. These projections are identified by river reach.

4. Development of future water use scenarios. The water depletion projections were arrayed for a sensitivity analysis in order to determine the effect of Montana water use on downstream water availability, and of upstream depletion (above Garrison Dam)

versus downstream depletion (below Garrison Dam) upon the main stem Missouri River navigation and hydropower production.

5. Performing computer operation studies of the six main stem Missouri River reservoirs and their output in terms of navigation, hydropower, and other functions authorized by the Flood Control Act of 1944. These operation studies take into account the depletions of water under each of the water use scenarios and simulate operation of the reservoir system in accordance with the criteria established under the Flood Control Act of 1944 and subsequent authorization and cost allocations. These computer studies were done by the Corps of Engineers, Missouri River Division, Reservoir Control Center, under an agreement with the State of Montana.

6. Analysis of the computer studies to determine:

   a) The sensitivity of the reservoir system outputs to levels of future Montana depletions.

   b) The sensitivity of system output to upper basin and lower basin depletions.

   c) The resulting system outputs that would be available under various water allocations among the upper basin and lower basin users.

PAST MISSOURI RIVER BASIN DEPLETION PROJECTIONS

Several projections of future Missouri River Basin depletions have been published over the past 12 years. Table III-1 summarizes various depletions used for computer operation analysis of the main stem Missouri River Reservoir system.

Table III-1 shows the water depletion projections from the Missouri River Basin Comprehensive Framework Study in terms of the timing of the future development and the location of the development, whether in the upper Missouri River Basin or the lower Missouri River Basin.

The first set of data for the 1970 through 2020 depletions was derived for the Missouri River Basin Framework Water Plan in 1969. As identified in Chapter II, 1975 depletions for all purposes in the Missouri River Basin totaled 11.7 million acre-feet per year. The Missouri River Basin Comprehensive Framework Study identified potential depletions totaling approximately 15.9 million acre-feet per year. These projections indicate a very high, rapid growth of water depletions for irrigation,

TABLE III-1 VARIOUS PROJECTED DEPLETIONS OF WATER FROM THE MISSOURI RIVER BASIN

1,000 Acre-Feet Per Year

A. 1969-Missouri River Basin Comprehensive Framework Study
(Missouri River Main Stem Reservoir Regulation Studies Series 6-69)

River Reach	1970-1980	1970-2000	1970-2020
Above Sioux City	2,335	5,415	9,243
Below Sioux City	1,998	4,184	6,724
TOTAL	4,333	9,599	15,967

B. 1974-Bureau of Reclamation Water Marketing Study[1]
(Missouri River Main Stem Reservoir Regulation Studies Series 1-74)

River Reach	1970-1980	1970-2000	1970-2020	1970-Ultimate
Above Sioux City	1,191	3,669	4,816	6,728
Below Sioux City	1,998	4,184	6,724	6,724
TOTAL	3,189	7,853	11,540	13,452

C. 1980-Bureau of Reclamation Power Marketing Study[1]
(Missouri River Main Stem Reservoir Regulation Studies Series 1-80)

River Reach	1975-1990	1975-2000	1975-2020	1975-2040	1975-2060
Above Sioux City	1,026	2,311	3,927	5,499	6,486
Below Sioux City	2,952	4,188	6,732	6,732	6,732
TOTAL	3,978	6,499	10,659	12,231	13,218

[1]Modified projections based on Missouri River Basin Comprehensive Framework Study.

energy, municipal, industry, rural domestic, livestock, reservoir evaporation, fish, wildlife, recreation, and land treatment in both the upper and lower Missouri River basins.

By 1974, in the Bureau of Reclamation Water Marketing Study, the projections of streamflow depletions had been considerably lowered for the upper Missouri River Basin but remained the same for the tributaries and main stem Missouri River below Sioux City, Iowa. Table III-1 shows that the projections from a 1980 power marketing study further decrease the projected rate of growth of future upstream depletions. Except for the 1975-1990 estimate, the projections downstream of Sioux City, Iowa, were not changed in any of the studies.

All past operation studies of the main stem Missouri River Reservoir system have shown that, over time, navigation and hydropower benefits have decreased because of upper basin depletions. An initial sensitivity analysis for this study indicated that water depletion from the main stem Missouri River and tributaries between Sioux City, Iowa, and Kansas City, Missouri, can also affect navigation and hydropower production, as well as upstream depletion. The reservoir system is operated to augment the tributary inflow between Sioux City and Kansas City. Reduction of this inflow affects navigation just as depletion of streamflow upstream of Sioux City, Iowa, affects navigation. Production of hydropower, a secondary operational consideration, is affected because the reservoir system is operated primarily for flood control and navigation purposes.

INFLUENCES ON FUTURE DEVELOPMENT

The alternative water depletion projections for this report were based on past projections altered into: (1) a high level, or fast growth of water depletions; (2) a medium rate of growth of depletions; and (3) a slow rate of growth of depletions. The modifications were based on judgments from the literature review and from the experience of planners involved in the study concerning those factors affecting the rate of growth of Missouri River Basin water depletions. These major influences on future water depletions include water conservation, economic conditions, energy cost and availability, and potential interbasin diversions.

Conservation

Water Conservation. Water conservation can greatly affect the amount of water withdrawn for many types of water uses. In some cases, however, the conservation of water withdrawals will not necessarily result in lowered water use depletions. Water conservation can greatly reduce the quantities of water withdrawn for irrigation but can have only a minor effect on the depletion resulting from irrigation. For example, an

increased efficiency of 10 percent for irrigation of 1 million acres could lower irrigation water withdrawals by 400,000 to 500,000 or more acre-feet of water per year. There would be small savings in such incidental losses as deep percolation and ditch losses associated with irrigation water conservation, but the actual crop evapotranspiration associated with the irrigation would not be reduced so long as the crop needs are met. Therefore, while the ratio of the depletion to the amount with drawn increases, the absolute amount of depletion remains essentially the same. For purposes of this study, irrigation water conservation in itself is not considered a basis for reducing depletions from irrigation development, except for those associated with interbasin diversions, such as the Garrison and High Plains diversion projects.

Land Conservation. The Missouri River Basin Comprehensive Framework report views land conservation measures as depletions of water. This is because the construction of such land conservation projects as farm ponds, land terraces and grassed waterways actually reduce the runoff that otherwise would reach the stream. Thus, they can be reflected as increased depletions to the stream system. The Framework report projected a considerable increase in the application of farm land management practices with an accompanying very large increase in water depletions throughout the basin. This projection was utilized with modifications, particularly for the low and medium projection levels.

Water Conservation in Energy Production. The generation of thermal electric energy requires water for cooling purposes. Two methods can be used -- flow-through cooling or water cooling towers. However, water depletions are similar under both types of processes.

Energy Conservation. Conservation of energy itself is the factor which will reduce water depletions for energy production. The slower the rate of increased demand for electricity and for synthetic fuels development from coal resources in the basin, the slower will be the rate of demand for new plants and accompanying water requirements.

Conservation has greatly slowed the rate of increase in the use of electric energy. Regional power planners have been using a short-term power demand growth rate of 5 percent compounded annually and 4 percent for long range planning. More recent power planning studies use a per capita consumption based on the current growth level of 2.7 percent and a growth in total demand which has decreased to about 3.6 percent. For long-term planning, a growth rate of about 3.3 percent is being utilized. These growth rates were utilized in the alternative projections of water depletion for energy production.

Municipal and Industrial (M & I) Water Conservation. Municipal water conservation may be an important matter for an individual community relying on a particular water source. However, in a total sense, municipal and accompanying industrial water use in the Missouri River Basin is not a large portion of the projected future uses. Although some variations in M & I water use were included in the alternative projections for this study, the M & I water use projections for several of the subbasins were held constant for low, medium, and high water depletion projections due to the small percentage of the total depletion projection that M & I water use represents.

Economic Conditions

Economic factors which can affect water resource development, particularly for irrigation projects, include interest rates and the financial support levels Congress allows for water development projects. Higher or lower interest rates can affect irrigation project feasibility and influence the undertaking of new projects. Interest rates can also affect the amount of borrowing by irrigation districts, ditch companies, or individuals to fund new systems for irrigating new land.

Project funding levels of Congress, state legislatures, and lending institutions for irrigation also affect the rate of growth of new irrigation and accompanying water depletions. Data on irrigated acreages contained in Chapter II tend to indicate that in the recent past individuals have found it economically feasible to invest in new irrigation. On the other hand, the funding for federal irrigation projects and for farm water management has steadily declined.

Consumption of energy is affected by economic conditions. The higher the rate of growth of the general economy, the higher the rate of growth of energy consumption in the United States and in the study region. Therefore, references of high or low rate of growth of the economy have accompanying inferences on the rate of growth of water depletions for energy production.

Economic conditions affect the development of industry. If economic conditions are good in the Missouri River Basin, industry may then move into the basin with an accompanying increase in the rate of growth of municipal residents. The combined municipal and industrial rate of growth will affect the future depletion of water for M & I purposes.

Other uses of water that can also be affected by economics include new impoundments, watershed improvements, land treatment measures, rural

domestic use, and livestock water use. The assumptions for energy demand used in the depletion projections are identified in the next section.

Energy Costs and Availability

Irrigation is a primary water using sector that is affected by energy costs and availability. Energy is needed for the pumping now used extensively in most new irrigation projects and in improved irrigation practices. The demand for electric energy by the irrigation sector adds to other demands and results in a need for additional energy production.

Until recently, increases in energy generating capacities could be supplied in part by relatively low cost hydroelectric power. As that source of power has become more fully utilized, more expensive types of generating stations have been constructed and the cost of electrical energy has risen. This energy availability/cost factor, considered with other economic and financial considerations, can affect the trend in increased irrigation. If the demand for new pump irrigation declines, there should be a corresponding decline in the demand for new energy producing capacity.

Increased energy costs can also affect development in other sectors. As energy costs increase, industries find ways of conservation which have corresponding reductions in demand for energy. A reduction in energy demand reduces the rate of increase in water depletions in the energy sector.

Perhaps the most direct relationship of energy costs and energy availability in the Missouri River Basin can be seen in irrigation projects authorized under the Pick-Sloan Missouri Basin Program. The federal government has allocated the cost of federal dams and related facilities among the project purposes such as irrigation, flood control, hydroelectric power, recreation, navigation, and fish and wildlife. A large allocation of the hydroelectric power is for irrigation pumping, not only for large projects such as the Garrison and Oahe units, but also for other participating projects of the Pick-Sloan Missouri Basin Program constructed on the upstream tributaries.

The project costs apportioned to the power functions have been suballocated to an irrigation pumping allocation. Currently about 20 percent of the system generating capacity is allocated for the Bureau of Reclamation irrigation projects, which are supplied with pumping energy at the cost of 2.5 mills per kilowatt hour.

The power allocated for irrigation pumping has not been fully utilized because of the slow development of the irrigation projects. In the meantime, all of the power generated by the main stem dams and other units in the power system is being utilized. The Western Area Power Administration has entered into temporary firm contracts with preference customers who utilize the presently unused irrigation pumping power. Preference customers include public entities such as municipalities, rural electric associations, and others. Contracts with the preferred customers contain provisions to accommodate the withdrawal of power to meet the irrigation pumping requirements for Pick-Sloan projects.

Federal projects that can be authorized under the Pick-Sloan Missouri Basin Program are in a sense unaffected by the availability and costs of electric energy insofar as pumping power is concerned. Nevertheless, there is a competition of sorts between the irrigation project interests and the preferred electric energy consumers. This competition results from the fact that the preferred customers can obtain relatively cheaper hydroelectric power for a longer period if the irrigation projects are not constructed. The average contractual rate for power sold to preferred customers will soon be 6.1 mills per kilowatt hour.

In formulating the low, medium, and high water depletion projections, the interrelationship of irrigation and power consumption was achieved by projecting lower irrigation with corresponding low energy developments, medium irrigation development with medium energy development, and high irrigation development with high energy development. Other obvious factors influencing energy growth rates are the general rate of growth of regional and national economy.

Legal and Environmental Conditions

Water projects are also often faced with problems other than economics, including legal and environmental considerations. The two largest projects in the Missouri River Basin so affected are the Garrison and Oahe projects in North Dakota and South Dakota, respectively. There are other reclamation projects throughout the basin which have not been undertaken for a variety of reasons. The Bureau of Reclamation projects authorized in virtually every tributary basin on the Missouri River have been deferred, dropped from consideration, or developed less slowly than originally planned. These factors have been taken into account in the alternative projection levels for this study.

Interbasin Diversions

Various proposals for interbasin diversions were described in Chapter II. One way interbasin diversions may affect the rate of growth of

Missouri River Basin water depletions is through the competition for water resources. As inbasin water depletions increase, those who object to such inbasin depletions will object even more strenuously to interbasin diversions, which are 100 percent depletive. Such objections can lead to water allocations by state. Under an allocation system, each state is forced to decide between inbasin water development and interbasin diversions in order to stay within the water allocations. Should the decisions be made in favor of interbasin diversions at the "expense" of inbasin diversions, then the total depletions to the Missouri River Basin would not exceed the amount previously projected for inbasin uses.

PROJECTIONS

The purpose for deriving low, medium, and high projections of future water depletions in the Missouri River Basin has been previously described. To reiterate, Table III-1 summarizes three previous water depletion projections based on the 1969 Framework Study with modifications. The modifications were made by the Bureau of Reclamation for the 1974 and 1980 main stem reservoir operations studies. It is noted in Table III-1 that the lower Missouri River Basin depletions have not been varied for the past operation studies.

Potential depletions for energy and irrigation development in the upper Missouri River Basin above Sioux City, Iowa, have been recently studied. The studies centered on ascertaining the water available for developing the coal resources of the area, as well as irrigation, and assessed the effects of various levels of water development on the main stem reservoir operation. Data from the various studies in the upper Missouri River Basin were utilized for the alternative projections.

However, there is a paucity of consistent data upon which to base alternative projections of future lower Missouri River Basin water depletions. The preliminary reservoir operation sensitivity analysis for this study indicated that a slower than projected growth rate of depletions in the lower Missouri River Basin could affect the operation of the main stem reservoir system and navigation on the river. This verified the need for low, medium, and high levels of projections of depletions in the basin below Sioux City, Iowa.

One use to be made of the depletion projections is an economic assessment of the implications of high or low water allocation for Montana and for downstream states. In making the projections, particular emphasis was given to the Montana activity. In addition to water use, study emphasis was placed upon interrelationships of Montana irrigation and energy/coal development on water depletions. Therefore, irrigated

acreages, coal tonnages mined, and types and capacities of energy producing plants were derived specifically for the economic analysis.

For the downstream areas of the basin, the economic analysis covered irrigation, navigation, hydropower, and interbasin diversion.

Depending upon the data available, the techniques used to derive the water use projections were varied for each of the areas involved. For example, the Missouri River Basin Commission has completed Level B studies in the Upper Missouri River and in the Yellowstone River and adjacent coal areas, and has completed a study on accelerated coal development for synfuel production. The Bureau of Reclamation has reported on many irrigation projects such as the Garrison diversion, Oahe project, and pumping units in North and South Dakota. The Bureau was somewhat reluctant to release specifics of its projection techniques, apparently because of the interrelationship of the pumping power for Pick-Sloan Missouri Basin irrigation projects and its power marketing program. Nevertheless, enough data were made available to assist in deriving the required projections. The methodology is described following introduction of the tables.

The tables summarizing the projections are as follows:

III-2 <u>Summary of Irrigated Acreage Projections</u>. This provides irrigated acreages for the entire Missouri River Basin and was prepared to derive water depletions (Table III-3) and to provide data for the economic impact analysis required in Chapter VI of this report.

III-3 <u>Summary of Projected Irrigation Water Use Depletions</u>

III-4 <u>Summary of Projected Energy Water Use Depletions</u>. This table shows the water depletions for alternative energy development projections relating primarily to extraction, production, generation and synthetic fuels.

III-5 <u>Summary of Projected Municipal and Industrial (M & I) Water Use Depletions</u>

III-6 <u>Summary of Projected Other Water Use Depletions</u>. Other water use depletions include those for rural domestic; land treatment; evaporation from major reservoirs and minor impoundments; and fish, wildlife, and recreation purposes.

III-7 Summary of Low, Medium, and High Projections for all Water Uses Except Major Interbasin Diversions. This table summarizes the depletion projections for all of the above uses. It does not include depletions for interbasin diversions.

III-8 Summary of Projected Depletions for Recently Proposed Major Interbasin Diversions. The components of "major interbasin diversions" are identified in the following section on methodology, but include only diversions out of the Missouri River Basin.

III-9 Projected Montana Coal Use Plants. See below.

III-10 Projected Montana Coal Mining Connected with Plant Use. Tables III-9 and III-10 were prepared to provide information for the economic impact analysis.

The river reaches in Tables III-2 through III-8 refer to the study reaches shown in Figure II-2.

Methodology for Upper Basin Projections

The following summary describes the methodology used for developing projections for the subbasins above Sioux City, Iowa, which comprise the upper Missouri River Basin.

Above Fort Peck. The upper Missouri Level B Study for Montana provided a basis from which to derive the projections. The Level B study presents year 2000 irrigation projects, energy developments, M & I water needs, and other water uses (livestock, rural, domestic, small pond evaporation, etc.). The Montana DNRC staff and Wright Water Engineers reviewed this information and jointly derived the irrigation and energy water uses presented in the tables. The irrigation projections include those projects identified in the Level B study and additional irrigation depletions that may be required for the water development plans set forth in the East Central and North Central Conservancy Districts reports. Appendix A of this report lists the specific projects in the Level B study. The energy water use depletion projections provide for the known coal development projects in the planning stage and for various levels of future additional coal development. The M & I and other water use depletion projections were derived from the Level B study.

Fort Peck to Garrison. This subbasin contains that portion of the upper Missouri River between Fort Peck Dam and Lake Sakakawea. Irrigation, energy, and potash developments in Montana identified by DNRC and

TABLE III-2 SUMMARY OF IRRIGATED ACREAGE PROJECTIONS

River Reach	Increased Irrigated Acres, 1,000's											
	1975-1990			1975-2000			1975-2020			1975-2040		
	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Above Fort Peck	34	80	184	80	184	288	184	288	368	288	368	472
Fort Peck to Garrison												
Montana	62	115	175	103	192	290	144	253	333	253	333	381
(Subtotal Montana)	(96)	(195)	(359)	(183)	(376)	(578)	(328)	(541)	(701)	(541)	(701)	(853)
Wyoming-North Dakota	64	108	150	162	266	395	354	462	553	462	553	1102
Fort Peck-Garrison TOTAL	126	223	325	265	458	685	498	715	886	715	886	1483
Garrison to Oahe	25	50	75	104	113	129	184	260	350	315	450	689
Oahe to Gavins Point	3	3	3	52	52	52	180	180	180	226	226	226
Gavins Point to Sioux City	60	60	60	72	72	72	240	240	240	300	300	300
Sioux City to Omaha	167	200	239	239	322	405	322	405	710	405	710	833
Omaha to Nebraska City	929	1095	1361	1095	1361	2100	1361	2100	2100	2100	2100	2100
Nebraska City to Kansas City	600	836	1050	836	1050	1293	1050	1293	2270	1293	2270	2400
Kansas City to Boonville	100	160	215	160	215	335	215	335	542	335	542	600
Boonville to Hermann	75	125	175	125	175	260	175	260	442	260	442	550
(Montana)	(96)	(195)	(359)	(183)	(376)	(578)	(328)	(541)	(701)	(541)	(701)	(853)
Total above Sioux City	248	416	647	573	879	1226	1286	1683	2024	1844	2230	3170
Total below Sioux City	1871	2416	3040	2455	3123	4393	3123	4393	6064	4393	6064	6483
TOTAL	2119	2832	3687	3028	4002	5619	4409	6076	8088	6237	8294	9653

TABLE III - 3 SUMMARY OF IRRIGATION WATER USE DEPLETIONS

1,000 Acre-Feet Per Year

River Reach	1975-1990			1975-2000			1975-2020			1975-2040		
	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Above Fort Peck	50	121	308	113	305	404	305	404	585	404	585	800
Fort Peck to Garrison	268	477	685	583	989	1464	1088	1540	1914	1540	1914	3238
Garrison to Oahe	44	87	130	181	197	224	320	452	609	548	783	1198
Oahe to Gavins Point	7	7	7	60	60	60	206	206	206	259	259	259
Gavins Point to Sioux City	100	100	84	80	72	60	220	204	150	204	204	204
Sioux City to Omaha	150	180	215	215	290	365	290	365	639	365	639	750
Omaha to Nebraska City	645	715	638	715	638	564	638	564	873	564	873	873
Nebraska City to Kansas City	420	585	735	585	735	905	735	905	1589	905	1589	1931
Kansas City to Boonville	60	96	129	96	129	201	129	201	325	201	325	360
Boonville to Hermann	45	75	105	75	105	156	105	156	265	156	265	330
Total above Sioux City	469	792	1214	1017	1623	2212	2139	2806	3464	2955	3745	5699
Total Below Sioux City	1320	1651	1822	1686	1897	2191	1897	2191	3691	2191	3691	4244
TOTAL	1789	2443	3036	2703	3520	4403	4036	4997	7155	5146	7436	9943

TABLE III-4 SUMMARY OF ENERGY WATER USE DEPLETIONS FROM THE MISSOURI RIVER BASIN

1,000 Acre-Feet Per Year

River Reach	1975-1990 Low	Med	High	1975-2000 Low	Med	High	1975-2020 Low	Med	High	1975-2040 Low	Med	High
Above Fort Peck	-	-	-	51	51	66	51	66	86	86	150	200
Fort Peck to Garrison [1]	150	198	293	248	430	634	380	634	889	634	889	1192
Garrison to Oahe [2]	27	51	123	86	196	472	253	583	672	278	623	672
Oahe to Gavins Point	-	-	-	-	-	-	-	-	-	-	-	-
Gavins Point to Sioux City	-	-	-	-	-	-	-	-	-	-	-	-
Sioux City to Omaha	-	-	11	-	10	19	-	20	38	20	38	50
Omaha to Nebraska City	16	37	62	37	62	99	62	99	99	99	99	136
Nebraska City to Kansas City	21	28	31	28	41	61	41	74	88	61	110	130
Kansas City to Boonville	14	21	28	28	37	41	54	74	102	65	90	123
Boonville to Hermann	11	41	55	43	55	81	81	84	147	124	120	217
Total above Sioux City	177	249	416	385	677	1172	684	1283	1647	998	1662	2064
Total below Sioux City	62	127	187	136	205	301	238	351	474	369	457	656
TOTAL	239	376	603	521	882	1473	922	1634	2121	1367	2119	2720

[1] Includes 20,000 A-F/Yr Coal Slurry Pipeline from Little Big Horn River in 1990 High and all other projections

[2] Includes ETSI 20,000-50,000 A-F/Yr Coal Slurry Pipeline from Lake Oahe

TABLE III - 5 SUMMARY OF M & I WATER USE DEPLETIONS

1,000 Acre-Feet Per Year

River Reach	1975-1990			1975-2000			1975-2020			1975-2040		
	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Above Fort Peck	10	10	10	16	16	16	16	16	45	45	75	100
Fort Peck to Garrison	9	12	16	15	19	27	19	27	34	27	34	44
Garrison to Oahe	6	13	13	16	16	16	19	19	19	22	22	22
Oahe to Gavins Point	-	-	-	-	-	-	-	-	-	-	-	-
Gavins Point to Sioux City	-	-	-	-	-	-	-	-	-	-	-	-
Sioux City to Omaha	8	8	8	14	14	14	30	30	30	45	45	45
Omaha to Nebraska City[1]	-	-	-	-	-	149	-	149	149	149	149	149
Nebraska City to Kansas City	31	31	31	40	40	40	65	65	65	80	80	80
Kansas City to Boonville	26	26	26	43	43	43	60	60	60	75	75	75
Boonville to Hermann	21	21	21	34	34	34	49	49	49	59	59	59
Total above Sioux City	25	35	39	47	51	59	54	62	98	94	131	166
Total Below Sioux City	86	86	86	131	131	280	204	353	353	408	408	408
TOTAL	111	121	125	178	182	339	258	415	451	502	539	574

[1] M & I water use from imports, transfers of irrigation water rights, conservation

TABLE III - 6 SUMMARY OF OTHER WATER USE DEPLETIONS

1,000 Acre-Feet Per Year

River Reach	1975-1990			1975-2000			1975-2020			1975-2040		
	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Above Fort Peck	2	2	2	3	3	10	3	10	15	15	25	58
Fort Peck to Garrison	27	29	29	49	51	50	51	50	47	50	47	44
Garrison to Oahe	3	3	3	6	6	6	6	9	9	12	12	12
Oahe to Gavins Point	-	-	-	-	-	-	-	-	-	-	-	-
Gavins Point to Sioux City	-	-	-	-	-	-	-	-	-	-	-	-
Sioux City to Omaha	78	100	150	100	150	166	200	250	337	337	337	337
Omaha to Nebraska City	143	163	392	163	392	784	392	784	784	784	784	784
Nebraska City to Kansas City	118	161	199	313	392	482	404	459	766	459	766	766
Kansas City to Boonville	136	194	249	177	221	303	189	261	378	261	378	378
Boonville to Hermann	93	113	155	124	158	185	130	161	259	161	259	259
Total above Sioux City	32	34	34	58	60	66	60	69	71	77	84	114
Total Below Sioux City	568	731	1145	877	1313	1920	1315	1915	2524	2002	2524	2524
TOTAL	600	765	1179	935	1373	1986	1375	1984	2595	2079	2608	2638

TABLE III-7 SUMMARY OF LOW, MEDIUM, AND HIGH PROJECTIONS OF MISSOURI RIVER BASIN DEPLETIONS FOR ALL WATER USES EXCEPT MAJOR INTERBASIN DIVERSIONS

1,000 Acre-Feet Per Year

River Reach	1975-1990			1975-2000			1975-2020			1975-2040		
	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Above Fort Peck	62	133	320	183	375	496	375	496	731	550	835	1158
Fort Peck to Garrison	454	716	1023	895	1489	2175	1538	2251	2884	2251	2884	4518
Garrison to Oahe	80	154	269	289	415	718	598	1063	1309	860	1440	1904
Oahe to Gavins Point	7	7	7	60	60	60	206	206	206	259	259	259
Gavins Point to Sioux City	100	100	84	80	72	60	220	204	150	204	204	204
Sioux City to Omaha	236	288	384	329	464	564	520	665	1044	767	1059	1182
Omaha to Nebraska City	804	915	1092	915	1092	1596	1092	1596	1905	1596	1905	1942
Nebraska City to Kansas City	590	805	996	966	1208	1488	1245	1503	2508	1505	2545	2907
Kansas City to Boonville	236	337	432	344	430	588	432	596	864	602	868	936
Boonville to Hermann	170	250	336	276	352	456	365	450	720	500	703	865
Total above Sioux City	703	1110	1703	1507	2411	3509	2937	4220	5280	4124	5622	8043
Total below Sioux City	2036	2595	3240	2830	3546	4692	3654	4810	7041	4970	7080	7832
TOTAL	2739	3705	4943	4337	5957	8201	6591	9030	12321	9094	12702	15875

TABLE III - 8 SUMMARY OF RECENTLY PROPOSED MAJOR INTERBASIN DIVERSIONS

1,000 Acre-Feet Per Year

River Reach	1975-1990 Low	Med	High	1975-2000 Low	Med	High	1975-2020 Low	Med	High	1975-2040 Low	Med	High
Above Fort Peck												
Fort Peck to Garrison												
Garrison to Oahe								1100	1100		1100	1100
Oahe to Gavins Point					2410	2410		4000	4000		4000	4000
Gavins Point to Sioux City												
Sioux City to Omaha												
Omaha to Nebraska City												
Nebraska City to Kansas City												
Kansas City to Boonville												
Boonville to Hermann												
Total above Sioux City	-	-	-	-	2410	2410	-	5100	5100	-	5100	5100
Total Below Sioux City	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL												

TABLE III-9 PROJECTED MONTANA COAL-USING PLANTS

			UPPER MISSOURI RIVER[1]			YELLOWSTONE RIVER BASIN[2] & MISSOURI RIVER BELOW FORT PECK		
Year	Projection Level	Thermal Electric (mw capacity)	Synfuel (bbl/day)	SNG (mmcf/day)	Fertilizer Plant	Thermal Electric (mw capacity)	Synfuel (bbl/day)	SNG (mmcf/day)
1990	Low	0				1,500		
	Medium	0				2,700		280
	High	0				5,100		280
2000	Low	1,400	100,000		1	2,700		280
	Medium	1,400	100,000		1	6,300	100,000	530
	High	1,400	100,000	250	1	7,300	200,000	780
2020	Low	1,400	100,000		1	6,300	100,000	530
	Medium	1,400	100,000	250	1	7,300	200,000	780
	High	1,400	100,000	500	1	15,800	300,000	1,280
2040	Low	1,400	100,000	500	1	7,300	200,000	780
	Medium	4,400	200,000	500	1	15,800	300,000	1,280
	High	6,400	200,000	750	4	17,800	500,000	2,280

[1]Study Reach 1 - above Fort Peck

[2]Study Reach 2 - includes the Yellowstone River Basin in Montana and that portion of the Montana Missouri River Basin downstream of Fort Peck and upstream of Lake Sakakawea (see Figure II-2).

Source: Montana DNRC and Wright Water Engineers staff analysis.

TABLE III-10 PROJECTED MONTANA COAL MINING CONNECTED WITH PLANT USE

Conversion Plant/Coal Tonnage Relationships[1]:

1,000 mw power	= 4 mm tons/year
250 mm cfp gas	= 7.6 mm tons/year
100,000 bbl/day liquid	= 18 mm tons/year
2,300 tpd Fertilizer	= 3.5 mm tons/year

Year	Projection Level	Plant Coal Mining, Million Tons/Year Missouri	Yellowstone & LM	Total
1990	Low	0	6.0	6.0
	Medium	0	19.3	19.3
	High	0	28.9	28.9
2000	Low	23.6	22.8	46.4
	Medium	23.6	62.8	86.4
	High	31.2	92.4	123.6
2020	Low	23.6	62.8	86.4
	Medium	31.2	92.4	123.6
	High	38.8	159.6	198.4
2040	Low	38.8	92.4	131.2
	Medium	31.2	159.6	190.8
	High	84.4	244.5	328.9

[1]Montana DNRC, January, 1977.

the Level B study were projected at low, medium, and high levels for the years 1990, 2000, 2020, and 2040.

The remainder of this tributary area of the Missouri River includes the Yellowstone River and those tributaries which enter Lake Sakakawea above Garrison Dam. Future water uses include those in Montana, Wyoming, and North Dakota. The Montana irrigation depletions include the depletions that occur from all of the state reserved irrigation water rights (not to be confused with federal reserved rights) in the Yellowstone River Basin. (See Appendix A.) The Montana energy depletion projections were derived from DNRC staff knowledge about coal development project planning and included projections for energy development on the Crow and Northern Cheyenne Indian reservations. Projections for the year 2020 and 2040 are extrapolations of projections made for 1990 and 2000.

The projections of water use in Wyoming were based on extrapolations of the Yellowstone Level B study identified water uses for the year 2000 including irrigation, energy, M & I, and other uses.

Projections for North Dakota include small pumping irrigation units, private irrigation development, and the Garrison Diversion Project. The Garrison Project has plans for an initial development of 96,000 acres as part of a first unit involving some 250,000 acres, and a total potential of over 1 million acres. In addition, the diversion includes water for fish and wildlife, water quality, and M & I water use. These uses were projected in differing quantities on a low, medium, and high basis through the year 2040 and were partially based on an analysis of the Bureau of Reclamation projections used in the Corps of Engineers Series I-80 study. The North Dakota energy depletion was derived taking into account the Section 13(a) and Level B studies.

The "other" water use category was based on Bureau of Reclamation (USBR) data and Canadian water use depletions identified for the upper Missouri area for a new reservoir and a thermal electric power plant. The Texas Eastern Pipeline Company's proposed coal slurry pipeline utilizing Little Big Horn River water was included in these projections even though it is an exportation of water from the Missouri River Basin. This was done because the diversion, 20,000 acre-feet per year, is insignificant when compared with the magnitude of the total depletions being considered. There are several proposals involving diversion of water from the Yellowstone River or Garrison Reservoir to adjacent coal areas. All of these were considered to be alternative ways of supplying water for the projected energy development, and there was no special identification of these proposals.

Garrison to Oahe. Projections for irrigation, energy, M & I, and other water uses were derived from the USBR projections with a variation provided to indicate a low, medium, and high level of development of each of these functional uses. The proposed ETSI coal slurry pipeline diversion and unidentified diversions of 20,000 and 30,000 acre-feet per year, respectively, as well as a proposed 7,600 acre-feet of M & I water use in western South Dakota, are included within the energy and M & I projections because of the small amount of these depletions compared with the total amount being considered. The Exxon proposal of developing 1.7 million acre-feet was divided into an energy component -- 600,000 acre-feet per year included in the inbasin energy water use figures; and an exportation component of 1.1 million acre-feet per year diverted to the Colorado River Basin which is included in the recently proposed major interbasin diversions in Table III-8.

Oahe to Gavins Point. The USBR projection of irrigation depletions indicated in the Corps of Engineers Series I-80 projection was utilized for all levels of projections because it is a relatively small depletion. The proposed High Plains diversion from Lake Francis Case above Fort Randall Dam was included as 2.41 million acre-feet per year level for the year 2000 in the major interbasin diversions and 4 million acre-feet per year for the years 2020 and 2040.

Gavins Point to Sioux City. For this reach the Bureau of Reclamation irrigation depletions were utilized. The return flows from the Garrison and Oahe projects in the James River enter the Missouri River in this reach. The future depletion levels given in the low, medium, and high irrigation projection for this study take into account the differing levels of the Garrison and Oahe projects that were projected and the development of irrigation in this reach of the river.

Methodology for Lower Basin Projections

The future water use projections for the lower Missouri River Basin below Sioux City, Iowa, were obtained in a much different way from the projections for the upper basin. The primary information utilized was the Missouri River Basin Comprehensive Study projections, data obtained from the Missouri Basin States Association on recent trends of irrigation development and energy development, and recently projected energy use growth rates published by the Missouri River Basin Commission. A primary reference utilized in the lower basin projections was Appendix Volume 6 of the Missouri River Basin Comprehensive Framework Study, 1969.

Since it is necessary to identify depletions by river reaches rather than by the subbasins used in the framework study, an analysis was made of the depletions listed in the framework study for the main stem reaches compared with the depletions listed by the subbasins, which do not match the main stem points. A methodology was developed to divide the depletions for the Niobrara, Platte, Middle Missouri River, Kansas, and Lower Missouri River subbasins into appropriate river reach depletions. The Sioux City to Nebraska City river reach depletions include the Niobrara subbasins and a portion of the Middle Missouri subbasin.

The Omaha to Nebraska City river reach depletions include the Platte subbasin. Existing and future water uses in the Platte River Basin do not necessarily relate to river depletions because of interbasin diversion of water from the Colorado River Basin into the Platte River Basin and because of transfers of water from irrigation use to M & I use. In addition, irrigation is rapidly growing in Nebraska through the use of groundwater, while at the same time the envisioned Central Nebraska Project and other USBR projects have been deferred. These complexities were taken into account in the projections by interpreting the Missouri River Basin Framework Study projections in relation to recent trends and modifying the study's future depletion figures in the low, medium, and high projections using judgment about faster or slower rates of water development. It was assumed that Platte River Basin depletions would not exceed the levels projected by the Framework Study for 2020 for any category of water use, except energy, because of limited water supplies.

The river reach Nebraska City to Kansas City consists of the Kansas River subbasin and a portion of the mid-Missouri River subbasin of the Missouri River Basin Framework Study. The lower Missouri subbasin of the study comprises the Kansas City to Boonville and Boonville to Hermann river reaches. The subbasin water use depletions were divided between the two reaches on a pro rata basis for this study.

Projected water use depletions for the three tributary areas comprising the lower three river reaches of the Missouri River Basin were based on modified Framework Study projections. The Framework Study projections were utilized as the high projection for the years 2000 and 2020. The year 1990 was derived from a percentage of the year 2000 projection on the basis of 60 percent of the 1975 to 2000 depletions. Data from the Missouri Basin States Association on trends of irrigation development were used to derive the low and medium irrigation depletion projections. Energy water use was projected from the existing water use indicated by the Association's current hydrology study, using the framework study and Missouri River Basin Commission Power Planning Committee's energy use growth rates. The variation among low, medium, and high

energy growth was established by varying the energy use growth rate and through the use of the Framework Study figures. For example, the high projection of energy water use was derived by using use growth rates of 5 percent for 1975-1990, 4 percent for 1990-2000, and 2 percent for 2000-2040.

M & I water use from the Framework Study was used for the lower Missouri River Basin projections in this study and was held constant for the low, medium, and high levels for each of the projection years. The "other" water use category causes some concern for the lower Missouri River Basin because the projected uses are very large compared to the other water uses projected. The "other" category includes large reservoir evaporation, small reservoir evaporation, minor pond evaporation, livestock water, watershed treatment and protection, wetlands and fish and wildlife areas, and importations. The Framework Study "other" water use figures were reduced by the amount of the increase in energy depletions derived by the methods previously described. For the high water use projection, the "other" water uses were used at the Missouri River Basin Framework Study levels (adjusted downward) so that the total increased water use at the high projection level would be the same as for the Framework Study. The low and medium projected "other" water uses were derived from a ratio of "other" water uses to the total water uses given in the framework study.

FUTURE WATER USE SCENARIOS

Purposes

The water use scenarios take the various projection levels (high, medium, and low) for depletions by river section (upstream of Garrison Dam and downstream of Garrison Dam) and combine them into possible alternative development sets. These sets and subsets are identified in Table III-11.

The scenarios serve several purposes. The first purpose is for an analysis of the sensitivity of the main stem reservoir system operations to Montana and other states' depletions above Garrison Dam.

Second, the water development scenarios provide a basis for the economic evaluation of possible alternative water use allocations. The inference at this point in the study is that water use allocations might be formalized, but allocation might also be indirectly accomplished through political or institutional processes. Indirect allocation would include future funding levels established in Congress for water development projects; establishment of project evaluation criteria or other requirements which could delay or stop projects; and imposition of institutional

TABLE III-11 SUMMARY OF WATER USE SCENARIOS

Scenario Number	Title	Growth in Average Annual Depletions		
		Upstream[1]	Downstream[2]	Other
1A	Effects of Upstream Depletions	Low	Medium	--
1B	Effects of Upstream Depletions	Medium	Medium	--
1C	Effects of Upstream Depletions	High	Medium	--
2A	High Upstream, Low Downstream	High	Low	--
2B	Low Upstream, High Downstream	Low	High	--
3A	High Energy Development	High	High	--
3B	Low Energy Development	Low	Low	--
4	Interbasin Diversions	Medium	Medium	Interbasin Diversions

[1]Upstream refers to that portion of the Missouri River Basin above Garrison Dam, and includes Montana depletions and depletions in other states above Garrison. This conforms to Reaches 1 and 2 in Figure II-2.

[2]Downstream refers to the rest of the Missouri River Basin below Garrison Dam.

NOTE: The division of "upstream" versus "downstream" at Garrison Dam (rather than the division at Sioux City) was done to identify the sensitivity of Montana's depletions to other uses. Because Montana's depletions were not isolated, this study used the depletions in Study Reaches 1 and 2 (Figure II-2) to perform this sensitivity analysis. The terms "upstream" and "downstream" are not to be confused with the terms "upper basin" and "lower basin," which terms indicate above Sioux City and below Sioux City, Iowa, respectively.

constraints affecting federal licensing, permitting, or other approvals of federal or private water projects and development projects with water components.

Another purpose of the future water development scenarios is to provide an assessment of the nature, scope, and timing of possible water use conflicts. For example, faster or slower rates of growth of water development may ultimately create the same conflict, but in an earlier or later time period. If that water conflict is to create a need for water allocation, the inference would be that the need to begin resolving the conflict and achieve water allocation could be immediate, or it could be deferred for several years. The nature of the water use conflict, that is, whether shortages to future consumptive uses or shortages of water for navigation, may determine the kind of allocation process that might be used. Depending upon the kind of water use conflict, existing institutional arrangements may already be a basis of water allocation, or further arrangements may be necessary to achieve a formal water allocation.

For the assessment of possible water conflicts, the Missouri River Basin was divided at Sioux City, Iowa. This point on the river was used to account for upper basin and lower basin depletions because it is downstream of the six main stem dams and is the head of navigation.

Description of Scenarios

The first set of three scenarios, 1A, 1B, and 1C, and the second set (Scenarios 2A and 2B) were devised to test the effects of Montana depletions and other upstream of Garrison Dam upon the operation of the six main stem Missouri River reservoirs and upon the navigation and hydroelectric power produced as a result of the reservoir operation.

Scenario 1A (low upstream depletions - medium downstream depletions) was derived from Table III-7 (Projections For All Water Uses Except Interbasin Diversions) by using the low rate of water development for the subbasins of the Missouri River Basin above Fort Peck Dam and from Fort Peck Dam to Garrison Dam. The medium projection given in Table III-7 was used as the donwstream rate of development for all subbasins below Garrison Dam. Scenario 1B is the same as Scenario 1A except that the medium rate of development above Garrison Dam was utilized along with the medium rate of development downstream. Scenario 1C uses the high rate of development given in Table III-7 for the two subbasins above Garrison Dam, while using the medium rate of growth in water depletions below Garrison Dam.

By using the three levels of upstream depletion in Set 1 and holding the downstream rate of growth of depletion constant, computer studies of main stem reservoir operations tested the effects of the rate of upstream depletion upon downstream navigation and hydroelectric power production. Both the upstream and downstream water depletion projections contain the components of irrigation, energy, M & I, and other water uses. The low, medium, and high water use projections for the upstream area reflect the influences of conservation, economic conditions, and energy cost and availability on future water developments previously described in this chapter.

In Set 2, Scenarios 2A (high upstream development - low downstream development) and 2B (low upstream development - high downstream developments) were used to test the effects of future water development on navigation and hydroelectric power production resulting from a fast or slow rate of growth of water depletions on the tributaries entering the Missouri River below Garrison Dam to Sioux City, Iowa, and on the main stem and tributaries entering the Missouri River downstream of Sioux City, Iowa. These projections were also derived from Table III-7 utilizing the appropriate high and low projection levels.

Set 3, Scenarios 3A and 3B, simply cover the alternative assumptions of a high rate of water development in the entire Missouri River Basin (3A) versus a low rate of water development in the entire basin (3B) as gauged by the depletion projections given in Table III-7. Scenarios 3A and 3B can be utilized to gauge the effects of basinwide consistent development rates on water availability and related economics.

Scenario 4 analyzes the effects of major interbasin diversions upon the Missouri River system for a medium rate of growth of Missouri River Basin depletions. The major interbasin diversions included in Scenario 4 are the proposed diversion to the High Plains and the diversion from the Missouri River to the Colorado River Basin proposed by Exxon Corporation.

Tables III-12 through III-19 contain data on the growth in average annual depletions in the Missouri River Basin by river reach for each of the identified scenarios.

Table III-12 Scenario 1A - Effects of Upstream Depletions - Growth in Average Annual Depletions, Missouri River Basin - Low Upstream Rate, Medium Downstream Rate

1,000 Acre-Feet Per Year[1]

River Reach	1975-1990	1975-2000	1975-2020	1975-2040
Above Fort Peck	62	183	375	550
Fort Peck to Garrison	454	895	1,538	2,251
Garrison To Oahe	154	415	1,063	1,440
Oahe to Gavins Point	7	60	206	259
Gavins Point to Sioux City	100	72	204	204
Sioux City to Omaha	288	464	665	1,059
Omaha to Nebraska City	915	1,092	1,596	1,905
Nebraska City to Kansas City	805	1,208	1,503	2,545
Kansas City to Boonville	337	430	596	868
Boonville to Hermann	250	352	450	703
Total above Sioux City[2]	777	1,625	3,386	4,704
Total Below Sioux City[2]	2,595	3,546	4,810	7,080
TOTAL	3,372	5,171	8,196	11,784

[1]Upstream-Downstream refers to a division point at Garrison Dam, used to test the sensitivity of system operations in relation to depletions above and below Garrison Dam.

[2]Sioux City, Iowa, is the traditional point of division on the Missouri River for the upper and lower Missouri River Basins, and it is the head of navigation on the river. This point is used to total upper and lower basin depletions.

Table III-13 Scenario 1B - Effects of Upstream Depletions -
Growth in Average Annual Depletions, Missouri River Basin -
Medium Upstream Rate, Medium Downstream Rate
1,000 Acre-Feet Per Year[1]

River Reach	1975-1990	1975-2000	1975-2020	1975-2040
Above Fort Peck	133	375	496	835
Fort Peck to Garrison	716	1,489	2,251	2,884
Garrison to Oahe	154	415	1,063	1,440
Oahe to Gavins Point	7	60	206	259
Gavins Point to Sioux City	100	72	204	204
Sioux City to Omaha	288	464	665	1,059
Omaha to Nebraska City	915	1,092	1,596	1,905
Nebraska City to Kansas City	805	1,208	1,503	2,545
Kansas City to Boonville	337	430	596	868
Boonville to Hermann	250	352	450	703
Total Above Sioux City[2]	1,110	2,411	4,220	5,622
Total Below Sioux City[2]	2,595	3,546	4,810	7,080
TOTAL	3,705	5,957	9,030	12,702

[1]Upstream-Downstream refers to a division point at Garrison Dam, used to test the sensitivity of system operations in relation to depletions above and below Garrison Dam.

[2]Sioux City, Iowa, is the traditional point of division on the Missouri River for the upper and lower Missouri River Basins, and it is the head of navigation on the river. This point is used to total upper and lower basin depletions.

Table III-14 Scenario 1C - Effects of Upstream Depletions - Growth in Average Annual Depletions, Missouri River Basin - High Upstream Rate, Medium Downstream Rate

1,000 Acre-Feet Per Year[1]

River Reach	1975-1990	1975-2000	1975-2020	1975-2040
Above Fort Peck	320	496	731	1,158
Fort Peck to Garrison	1,023	2,175	2,884	4,518
Garrison to Oahe	154	415	1,063	1,440
Oahe to Gavins Point	7	60	206	259
Gavins Point to Sioux City	100	72	204	204
Sioux City to Omaha	288	464	665	1,059
Omaha to Nebraska City	915	1,092	1,596	1,905
Nebraska City to Kansas City	805	1,208	1,503	2,545
Kansas City to Boonville	337	430	596	868
Boonville to Hermann	250	352	450	703
Total Above Sioux City[2]	1,604	3,218	5,088	7,579
Total below Sioux City[2]	2,595	3,546	4,810	7,080
TOTAL	4,199	6,764	9,898	14,659

[1]Upstream-Downstream refers to a division point at Garrison Dam, used to test the sensitivity of system operations in relation to depletions above and below Garrison Dam.

[2]Sioux City, Iowa, is the traditional point of division on the Missouri River for the upper and lower Missouri River Basins, and it is the head of navigation on the river. This point is used to total upper and lower basin depletions.

Table III-15 Scenario 2A - High Upstream, Low Downstream -

Growth in Average Annual Depletions, Missouri River Basin

High Upstream Rate, Low Downstream Rate

1,000 Acre-Feet Per Year[1]

River Reach	1975-1990	1975-2000	1975-2020	1975-2040
Above Fort Peck	320	496	731	1,158
Fort Peck to Garrison	1,023	2,175	2,884	4,518
Garrison to Oahe	80	289	598	860
Oahe to Gavins Point	7	60	206	259
Gavins Point to Sioux City	100	80	220	204
Sioux City to Omaha	236	329	520	767
Omaha to Nebraska City	804	915	1,092	1,596
Nebraska City to Kansas City	590	966	1,245	1,505
Kansas City to Boonville	236	344	432	602
Boonville to Hermann	170	276	365	500
Total Above Sioux City[2]	1,530	3,100	4,639	6,999
Total Below Sioux City[2]	2,036	2,830	3,654	4,970
TOTAL	3,566	5,930	8,293	11,969

[1] Upstream-Downstream refers to a division point at Garrison Dam, used to test the sensitivity of system operations in relation to depletions above and below Garrison Dam.

[2] Sioux City, Iowa, is the traditional point of division on the Missouri River for the upper and lower Missouri River Basins, and it is the head of navigation on the river. This point is used to total upper and lower basin depletions.

Table III-16 Scenario 2B - Low Upstream, High Downstream - Growth in Average Annual Depletions, Missouri River Basin - Low Upstream Rate, High Downstream Rate

1,000 Acre-Feet Per Year[1]

River Reach	1975-1990	1975-2000	1975-2020	1975-2040
Above Fort Peck	62	183	375	550
Fort Peck to Garrison	454	895	1,538	2,251
Garrison to Oahe	269	718	1,309	1,904
Oahe to Gavins Point	7	60	206	259
Gavins Point to Sioux City	84	60	150	204
Sioux City to Omaha	384	564	1,044	1,182
Omaha to Nebraska City	1,092	1,596	1,905	1,942
Nebraska City to Kansas City	996	1,488	2,508	2,907
Kansas City to Boonville	432	588	864	936
Boonville to Hermann	336	456	720	865
Total Above Sioux City[2]	876	1,916	3,578	5,168
Total Below Sioux City[2]	3,240	4,692	7,042	7,832
TOTAL	4,116	6,608	10,620	13,000

[1] Upstream-Downstream refers to a division point at Garrison Dam, used to test the sensitivity of system operations in relation to depletions above and below Garrison Dam.

[2] Sioux City, Iowa, is the traditional point of division on the Missouri River for the upper and lower Missouri River Basins, and it is the head of navigation on the river. This point is used to total upper and lower basin depletions.

Table III- 17 Scenario 3A - High Energy Development -

Growth in Average Annual Depletions, Missouri River Basin -

High Upstream Rate, High Downstream Rate

1,000 Acre-Feet Per Year[1]

River Reach	1975-1990	1975-2000	1975-2020	1975-2040
Above Fort Peck	320	496	731	1,158
Fort Peck to Garrison	1,023	2,175	2,884	4,518
Garrison to Oahe	269	718	1,309	1,904
Oahe to Gavins Point	7	60	206	259
Gavins Point to Sioux City	84	60	150	204
Sioux City to Omaha	384	564	1,044	1,182
Omaha to Nebraska City	1,092	1,596	1,905	1,942
Nebraska City to Kansas City	996	1,488	2,508	2,907
Kansas City to Boonville	432	588	864	936
Boonville to Hermann	336	456	720	865
Total above Sioux City[2]	1,703	3,509	5,280	8,043
Total below Sioux City[2]	3,240	4,692	7,041	7,832
TOTAL	4,943	8,201	12,321	15,875

[1]Upstream-Downstream refers to a division point at Garrison Dam, used to test the sensitivity of system operations in relation to depletions above and below Garrison Dam.

[2]Sioux City, Iowa, is the traditional point of division on the Missouri River for the upper and lower Missouri River Basins, and it is the head of navigation on the river. This point is used to total upper and lower basin depletions.

Table III-18 Scenario 3B - Low Basin Water Development -

Growth in Average Annual Depletions, Missouri River Basin -

Low Upstream Rate, Low Downstream Rate

1,000 Acre-Feet Per Year[1]

River Reach	1975-1990	1975-2000	1975-2020	1975-2040
Above Fort Peck	62	183	375	550
Fort Peck to Garrison	454	895	1,538	2,251
Garrison to Oahe	80	289	598	860
Oahe to Gavins Point	7	60	206	259
Gavins Point to Sioux City	100	80	220	204
Sioux City to Omaha	236	329	520	767
Omaha to Nebraska City	804	915	1,092	1,596
Nebraska City to Kansas City	590	966	1,245	1,505
Kansas City to Boonville	236	344	432	602
Boonville to Hermann	170	276	365	500
Total Above Sioux City[2]	703	1,507	2,937	4,124
Total Below Sioux City[2]	2,036	2,830	3,654	4,970
TOTAL	2,739	4,337	6,591	9,094

[1]Upstream-Downstream refers to a division point at Garrison Dam, used to test the sensitivity of system operations in relation to depletions above and below Garrison Dam.

[2]Sioux City, Iowa, is the traditional point of division on the Missouri River for the upper and lower Missouri River Basins, and it is the head of navigation on the river. This point is used to total upper and lower basin depletions.

Table III-19 Scenario 4 - Interbasin Diversions -

Growth in Average Annual Depletions, Missouri River Basin -

Medium Upstream Rate, Medium Downstream Rate, Interbasin Diversions

1,000 Acre-Feet Per Year[1]

River Reach	1975-1990	1975-2000	1975-2020	1975-2040
Above Fort Peck	133	375	496	835
Fort Peck to Garrison	716	1,489	2,251	2,884
Garrison to Oahe	154	415	2,163	2,540
Oahe to Gavins Point	7	2,470	4,206	4,259
Gavins Point to Sioux City	100	72	204	204
Sioux City to Omaha	288	464	665	1,059
Omaha to Nebraska City	915	1,092	1,596	1,905
Nebraska City to Kansas City	805	1,208	1,503	2,545
Kansas City to Boonville	337	430	596	868
Boonville to Hermann	250	352	450	703
Total above Sioux City[2]	1,110	4,821	9,320	10,722
Total below Sioux City[2]	2,595	3,546	4,810	7,080
TOTAL	3,705	8,367	14,130	17,802

[1] Upstream-Downstream refers to a division point at Garrison Dam, used to test the sensitivity of system operations in relation to depletions above and below Garrison Dam.

[2] Sioux City, Iowa, is the traditional point of division on the Missouri River for the upper and lower Missouri River Basins, and it is the head of navigation on the river. This point is used to total upper and lower basin depletions.

Computer Studies

The scenarios represent estimates of future water depletions that would occur at each of the major points on the main stem Missouri River. These points are shown on Figure II-2. In the upper basin above Sioux City, major river points are associated with the six main stem dams. In the lower basin, the major points on the river are downstream of major tributaries, and they are of importance in determining flow levels associated with navigation service and other hydrologic river operating criteria.

The scenarios were submitted to the U.S. Army Corps of Engineers, Missouri River Division, Reservoir Control Center for analysis utilizing the reservoir system computer model. The computer model utilizes the historic streamflow data, modifies the historic flows by the amount of future water depletions indicated for each subbasin for the specific time frame under consideration, and simulates the main stem Missouri River reservoir operation and resulting controlled river flows.

The Corps of Engineers model includes all of the operating criteria for each of the six main stem reservoirs. These criteria were developed to meet the objectives specified in the Flood Control Act of 1944, described in Chapter II of this report. The specific criteria programmed into the computer model include operating rules to meet various functional requirements and adjustments for physical conditions as follows:

1. Reservoir sedimentation and river degradation is accounted for as these processes affect hydropower production. This varies over time with the effects of sediment load carried into reservoirs, and river degradation as a result of release below the dams.

2. Minimum flow criteria is provided, including water quality control minimums at Sioux City, Omaha, and Kansas City, and a municipal water supply release at Gavins Point Dam.

3. Navigation service is provided on the basis of an eight-month season. Full service is made possible by a streamflow level of 31,000 cfs at Sioux City, Iowa, enabling a 300-foot wide, 9-foot deep channel, and minimum service by a level of 25,000 cfs at Sioux City, Iowa, requiring reduced barge loading. (For this study navigation was converted to the number of months that the full service level could be provided.) Other flow levels are established at Omaha, Nebraska City, and Kansas. Criteria

include operational reservoir elevation levels at Gavins Point Dam in conjunction with navigation operations.

4. Minimum flow criteria between main stem dams was met under all conditions at times when water is not being released for flood control, navigation, or hydropower production.

5. Flood control regulation includes both system storage criteria and maximum release rates for each dam.

6. Hydropower production criteria are tailored to fit other operational criteria, considering power plant capacities and criteria for balancing the winter storage pool elevations at Fort Peck, Garrison, and Oahe dams.

The historic period of streamflow record utilized in the computer model studies includes monthly streamflow volumes for the years 1898 through 1979. The computer model takes the historic period of record, adjusts it to the 1949 level of streamflow depletions, applies an adjustment to the 1975 level of depletion, then applies the depletion from 1975 to the future year in question, and calculates the river inflows for each of the river reaches. The model operates the reservoirs for all of the criteria indicated above. The computer model results consist of a printout for flow levels, navigation service, and hydropower production for each of the years of the hydrologic period. Summary tables are provided for the 1898 through 1979 period and the 1934 through 1942 drought period. A summary is provided for the 1898-1933 and 1943-1979 "average conditions" period.

The Corps of Engineers separates the drought period from the total hydrologic period in order to obtain the measure of average hydroelectric power production (and navigation service) under "normal conditions." The 1934 through 1942 conditions were considerably below normal. This drought has an estimated recurrence probability of between 2 and 3 percent.

On the basis of past studies and preliminary results for this study, it was determined that the year 2000 is the critical time for occurrence or nonoccurrence of upstream-downstream water use conflicts. Therefore, the results of all scenarios were obtained for the year 2000. To aid in the analysis, results for selected scenarios were obtained for the year 2020.

Table III-20 tabulates depletions, flows, and needs summarized for analysis of the water development scenarios. Tabulated for each scenario

TABLE III-20 SUMMARY OF ANALYSIS OF WATER DEVELOPMENT SCENARIOS

YEAR 2000

Scenario	Increased Upper Basin Depletion (1000 A-F/YR)	Increased Lower Basin Depletion (1000 A-F/YR)	2000 Level Flows: Sioux City (1000 A-F/YR)	2000 Level Flows: Hermann (A-F/YR)	Navigation Service: Average Years [2] (Months per Year) [4]	Navigation Service: Drought Period [3] (Years of No Service)	Hydropower Generation: Average Years [2] (Million KW Hours)	Hydropower Generation: Drought Period [3] (Million KW Hours)
1975 Level	0	0	21,725[1]	54,559[1]	7.7	0	10,408	5,408
1A*	1,625	3,546	20,221	49,505	7.5	0	9,698	4,587
1B	2,411	3,546	19,501	48,785	7.4	3	9,285	4,142
1C*	3,218	3,546	18,662	47,945	7.2	3	8,872	3,825
2A*	3,100	2,830	18,762	48,765	7.2	2	8,924	3,905
2B*	1,916	4,692	19,988	48,132	7.4	1	9,606	4,387
3A	3,509	4,692	18,404	46,547	7.1	4	8,743	3,620
3B	1,507	2,830	20,370	50,374	7.5	0[5]	9,755	4,647
4	4,821	3,546	17,198	46,482	6.6	5	8,918	3,787

Source: Wright Water Engineers and U.S. Army Corps of Engineers, Missouri River Division, Reservoir Control Center.

[1] 1975 depletion level flows, rest of column is Year 2000 depletion level flows derived from computer operation studies.

[2] 1898-1933, 1943-1979.

[3] 1934-1942 drought period. This drought has a 2 to 3 percent chance of occurence.

[4] Full service is 8 months per year, 35,000 cfs at Sioux City, Iowa; reduced service is less than 35,000 cfs, down to 29,000 cfs minimum service. For this study, reduced service was converted by WWE to full service, shorter seasons for comparison purposes.

[5] Computer study showed 1 year of no service, but with operational adjustment, service could have been provided as in Scenario 1A.

are: (1) the increased upper and lower basin depletions[1]; (2) the year 2000 average streamflows at Sioux City, Iowa, and Hermann, Missouri; (3) navigation service in terms of no service during the nine-year drought period; and (4) hydropower generation for the average years 1898-1933, 1943-1979 and in the 1934-1942 drought period.

Analysis

Data in Table III-20 were plotted graphically to aid in analysis. The increase in upper or lower basin depletions over the 1975 level at the year 2000 level were plotted versus the number of years during the drought period in which no navigation service can be provided because of water shortage. Figure III-1 is a plot of upper basin depletions versus navigation service. Figure III-2 is a plot of lower basin depletion versus navigation service. Figures III-3 and III-4 are graphs of upper and lower basin depletions versus hydropower production in the average years and drought years.

When running the model, the Corps of Engineers personnel must analyze the computer output to determine if the system actually optimizes navigation during the drought period. Minor adjustments made as a step in the computer studies are based on judgment of whether or not the system might be operated slightly differently to achieve more navigation. It is believed this adjusting does not affect the average results from the computer model studies, but it may make a difference between whether a computer study indicates that a year of no navigation service will

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[1] The depletions for this part of the study were divided into depletions above and below Sioux City, Iowa. This slightly modifies some of the scenarios. Because low/medium/high rates of development for the scenarios listed in Table III-1 are split at Garrison Dam, the reorganization of the depletions into "upper basin" and "lower basin" means that in some cases the "upper basin" depletions are a combination of two development rates. Where this occurs, the modified scenario is noted with an asterisk. For example, Scenario 1A represents a low development rate upstream of Garrison Dam and a medium rate downstream. Scenario 1A* combines a low development rate above Garrison Dam and medium development rate between Garrison Dam and Sioux City, Iowa, for a total upper basin depletion amount. This was done to enable a proper accounting of the primary river depletions affecting navigation, which begins at Sioux City.

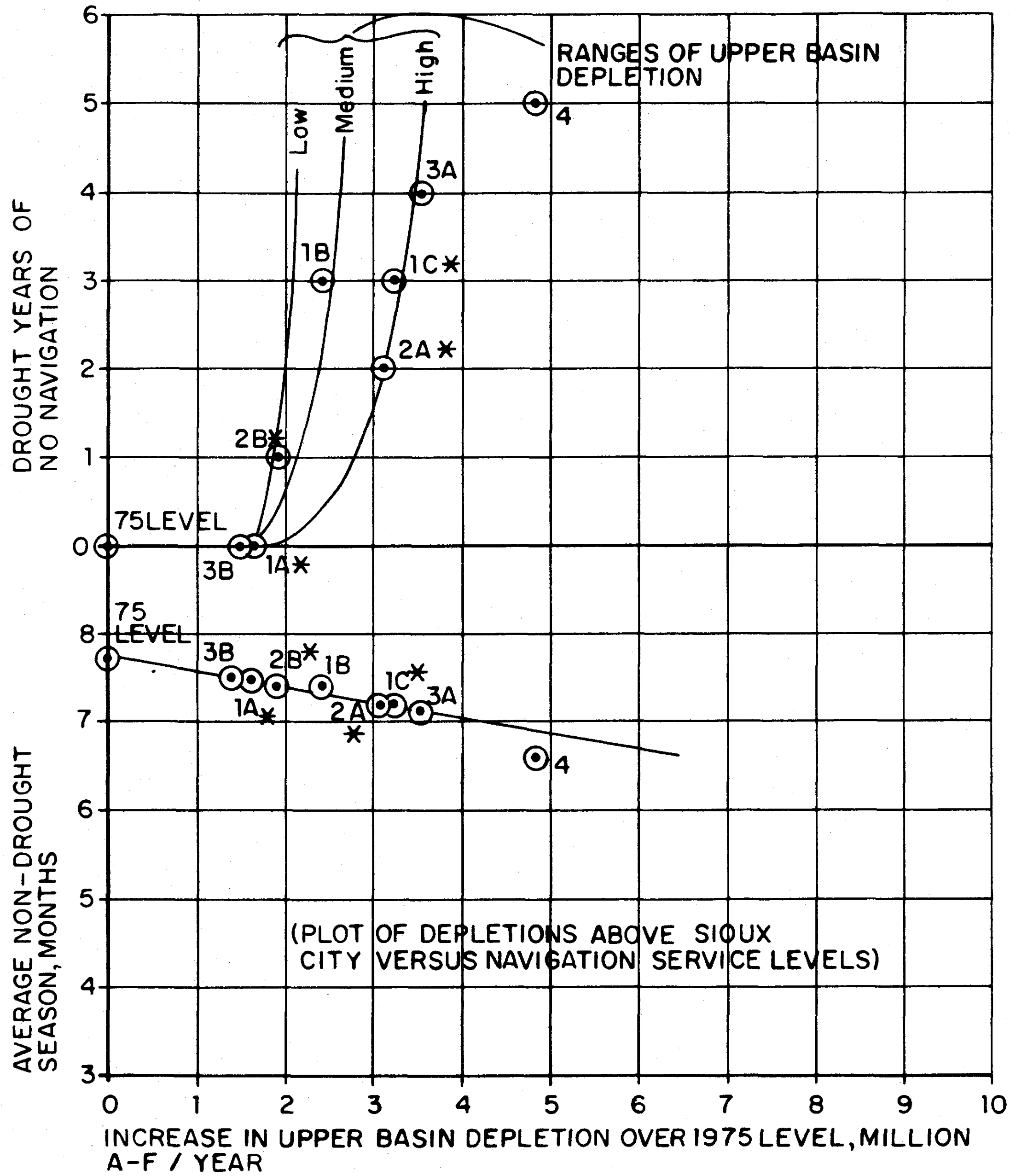


FIGURE III-1 EFFECTS OF UPPER BASIN DEPLETION ON MISSOURI RIVER NAVIGATION SERVICE, YEAR 2000

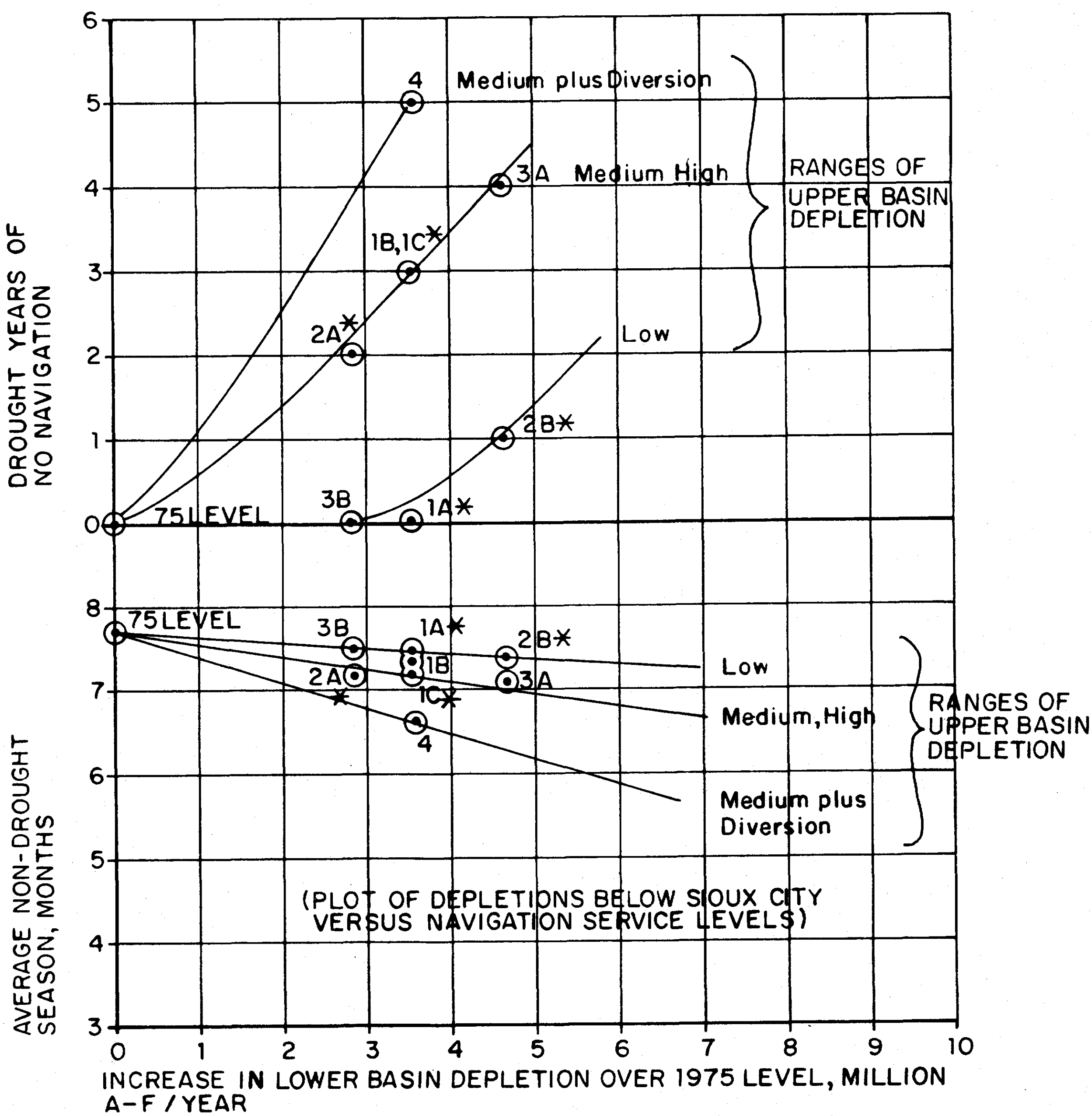


FIGURE III - 2 EFFECTS OF LOWER BASIN DEPLETION ON MISSOURI RIVER NAVIGATION SERVICE, YEAR 2000.

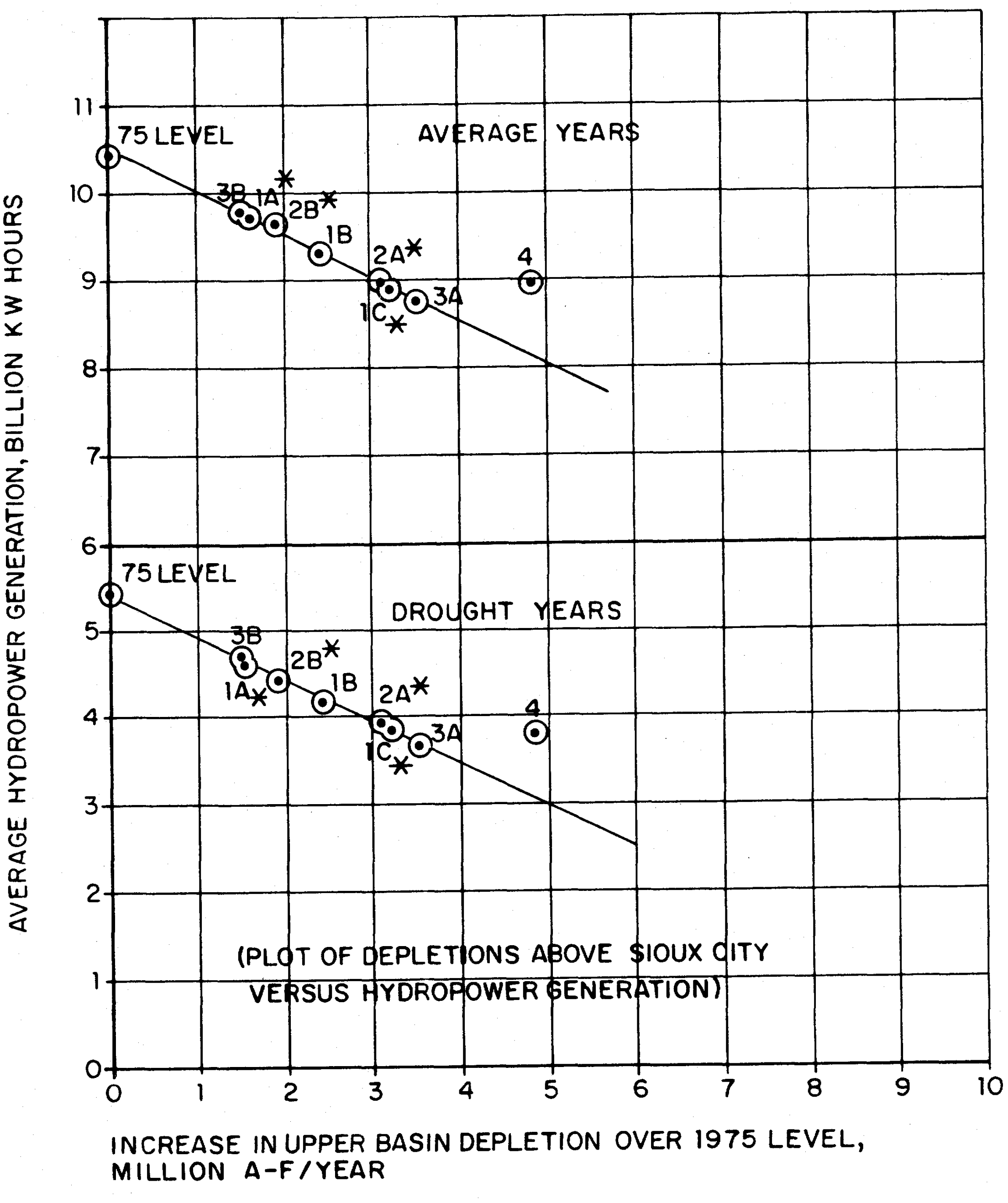


FIGURE III-3 EFFECTS OF UPPER BASIN DEPLETION ON MAIN STEM DAM HYDROPOWER PRODUCTION, YEAR 2000

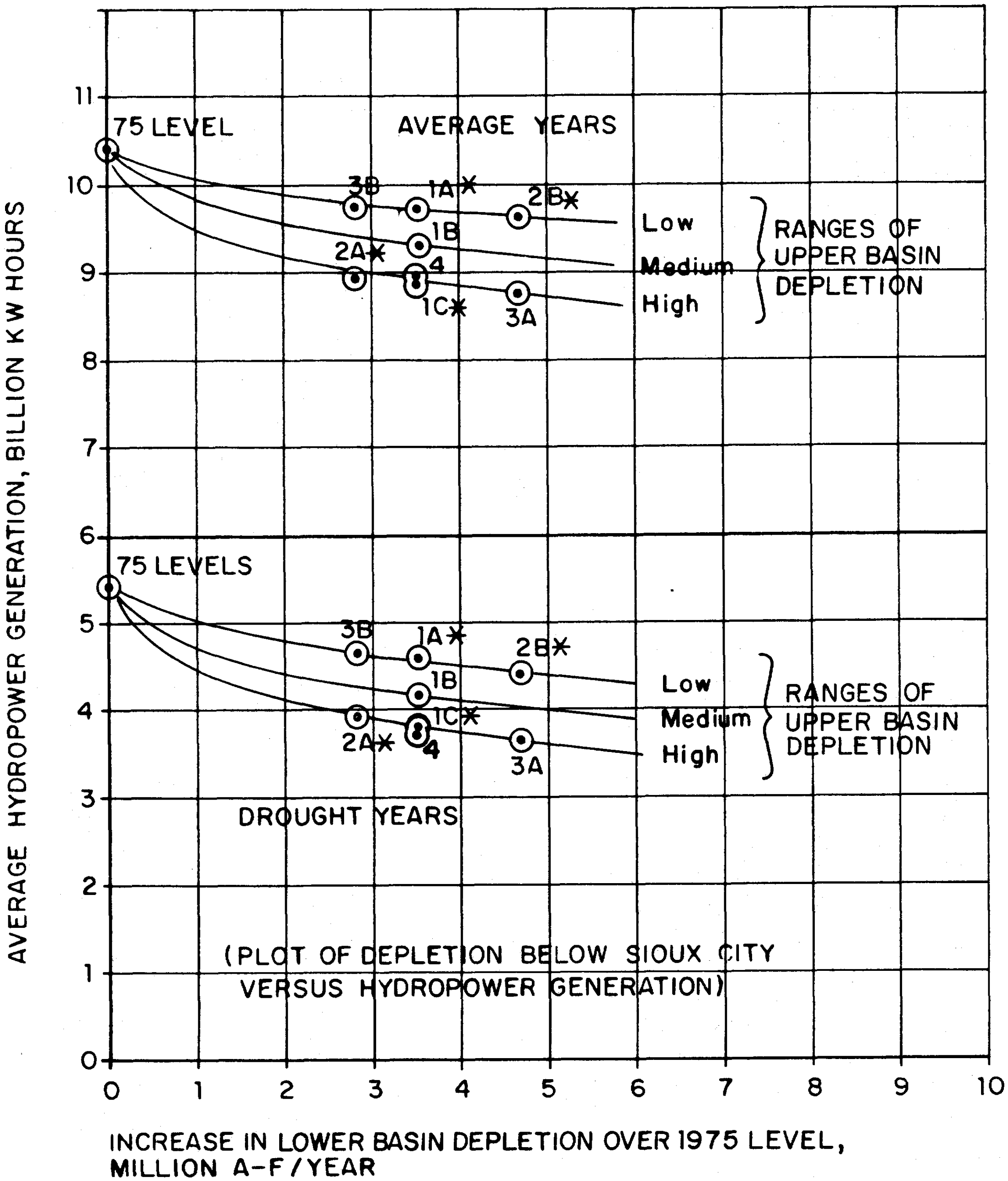


FIGURE III-4 EFFECTS OF LOWER BASIN DEPLETION ON MAIN STEM DAM HYDROPOWER PRODUCTION, YEAR 2000

result from a certain level of development, or whether the service will have to be suspended for a year during the drought.

The sensitivity of the system to depletions in Montana and other states above Garrison Dam is illustrated by Scenarios 1A, 1B, and 1C. Figure III-1 shows that average navigation service decreases as the Montana and upstream depletion increases. On Figure III-3, it is also seen that, as the upstream depletion increases, hydropower production in average and drought years decreases.

Sensitivity of the system navigation to upper basin and lower basin depletion is more complex to analyze. On Figure III-2, lines of approximately equal upper basin depletion have been plotted. It is noted that average season navigation declines as the lower basin depletion increases. From Figure III-4 it can be seen that hydropower production also decreases as lower basin depletion increases, if upper basin depletion is held relatively constant. This is to be expected since hydropower production is related to flow releases for navigation service.

The necessity to shut down navigation during the drought period because of insufficient flows is of significance to the economics of navigation. The river operation studies have all shown that as basin depletions increase, years of no service will occur. It is felt that perhaps one year of no navigation during a drought period could be tolerated even though it would have a severe impact on the industry. Several years of no navigation (probably any time over one year) would likely cripple the industry. Figure III-1 has lines of approximately equal upstream depletion on the section of the graph showing years of no navigation service. Similarly, Figure III-2 has lines of equal upstream depletion drawn on the portion of the drought years with no navigation service. These graphs illustrate that depletion of water in tributary areas and from the main stem of the Missouri River downstream of Sioux City, Iowa, can affect the navigation service by increasing the number of years that no navigation can be provided. If upper basin depletion is held at 1.625 million acre-feet and lower basin depletion is held to between 2.83 and 3.546 million acre-feet (Scenarios 1A* and 3B*), navigation service of a shortened season can be provided in all years of a drought period. If upper basin depletion is at 1.625 million acre-feet and lower basin depletion is at 4.692 million acre-feet (Scenario 2B), then navigation will be suspended in one year of a drought period. If year 2000 upper basin depletion is at a level from 3 million to 3 1/2 million acre-feet above the 1975 level and lower basin depletion is at 2.830 million acre-feet (Scenario 2A), two years of no navigation service will result. In the year 2000 if both upper and lower basin depletions are at a high level

(Scenario 3A), then four consecutive years of no navigation service will occur during a 9-year drought. The relationship of streamflow, depletion, and navigation is summarized in the next section of this chapter.

If interbasin diversions are superimposed upon a medium level of upstream and downstream Missouri River Basin depletion in the year 2000, the number of years that navigation must be suspended will increase to five.

Table III-20 serves as a summary on which to base the timing and type of conflicts of upper versus lower Missouri River Basin water use. A similar tabulation for the year 2020 is given in Table III-21.

Change in river stage is another kind of impact that can occur to the Missouri River below the main stem reservoirs (Osterberg, 1982). The range of river stage change indicated for Scenarios 1 through 3 would apparently be a decline between 1 and 2 feet. Scenario 4 depletion would apparently result in a river stage over two feet lower than present at the year 2000 depletion level. A detailed study would be required to quantify the specific effects of lower river stage; however, facilities that can be affected include commercial and recreation navigation facilities, power plant and municipal water intake structures, reduced fish and wildlife habitat, and visual attractiveness.

Relationship of Depletion, Streamflow, and Navigation

The navigation channel maintained by the Corps of Engineers under current authorization provides a 300-foot wide channel and a 9-foot deep channel for full service. The eight-month navigation season requires 31,000 cfs at Sioux City for maintaining full service navigation. The four-month winter season minimum flow requirement is 6,000 cfs. Altogether, the flow requirements amount to an annual total of 16.4 million acre-feet of water flowing past Sioux City, Iowa.

At the 1975 level of water development, there is a gain in the river of approximately 1.4 million acre-feet per year between Gavins Point, the lowest of the six main stem dams, and Sioux City. The navigation season gain amounts to about 1.3 million acre-feet per year. Thus, the required release of water from Gavins Point Dam is 15.1 million acre-feet per year annually for minimum streamflow maintenance and navigation service.

The average annual flow of the Missouri River at Sioux City for the period of 1898 through 1979, at the 1975 level of depletion, is 21,725,000 acre-feet per year. This 82-year period includes a 9-year drought period, 1934-1942. The Corps of Engineers reservoir regulation

TABLE III- 21 SUMMARY OF ANALYSIS OF WATER DEVELOPMENT SCENARIOS

YEAR 2020

Scenario	Increased Upper Basin Depletion (1000 A-F/YR)	Increased Lower Basin Depletion (1000 A-F/YR)	2020 Level Flows		Navigation Service		Hydropower Generation	
			Sioux City (1000 A-F/YR)	Hermann (A-F/YR)	Average Years [2] [3] (Months per Year)	Drought Period [3] (Years of No Service)	Average Years (Million KW Hours)	Drought Period [3] (Million KW Hours)
1975 Level	0	0	21,725[1]	54,559[1]	7.7	0	10,408	5,408
1A*	3,386	4,810	18,571	46,594	7.1	3	9,154	3,995
1B	4,220	4,810	17,751	45,774	6.9	5	8,696	3,608
1C*	5,088	4,810	16,876	44,902	6.8	8	8,280	3,050
2A*	4,639	3,654	17,326	46,513	6.9	7	8,440	3,259
2B*	3,578	7,042	18,389	44,180	6.8	4	9,000	3,917
3A	5,280	7,042	16,798	42,590	6.5	8	8,100	2,966
3B	2,937	3,654	18,963	48,150	7.2	2	9,316	4,242
4	9,320	4,810	12,511	40,535	4.1	36[5]	7,686	3,488

Source: Wright Water Engineers and U.S. Army Corps of Engineers, Missouri River Division, Reservoir Control Center.

[1] 1975 depletion level flows, rest of column is year 2020 depletion level flows derived from computer operation studies.

[2] 1898-1933, 1943-1979.

[3] 1934-1942 drought period. This drought has a 2 to 3 percent chance of occurence.

[4] Full service is 8 months per year, 35,000 cfs at Sioux City, Iowa; reduced service is less than 35,000 cfs, down to 29,000 cfs minimum service. For this study, reduced service was converted by WWE to full service, shorter seasons for comparison purposes.

[5] In a period similar to 1898 to 1979, navigation would be shut down 15 consecutive years (1930-1944), plus 21 other years.

computer studies indicate that the drought period average river flow at Sioux City, Iowa, is 13,829,000 acre-feet per year. During the 73-year, nondrought period, encompassing the years 1898-1933 and 1943-1979, flood control operations are in effect during many years, as are flow levels exceeding full service requirements. Extended navigation seasons are provided during some years. During the drought years, navigation service of less than full service is provided in the 9-year drought period with seasons as short as 5 1/2 months. It is important to note that the Corps of Engineers operation studies show that a reduced level of navigation could be provided by shortening seasons during the entire drought period, or by reducing flow levels for a longer period and undertaking dredging operations.

As depletions increase in the upper basin, flows reaching the main stem reservoir system will decrease. It is obvious that low river flows can occur for long periods of time. The pertinent question is: beyond what level of depletion will the streamflows be insufficient to provide navigation for an extended number of years?

The data show that as upper basin depletions increase about 1.6 to 1.7 million acre-feet per year over the 1975 level, navigation would have to be shut down at least one year during the drought period. As upper basin depletion increases to 2.4 million acre-feet per year, navigation would be shut down for three consecutive years during the 9-year drought period.

Table III-22 shows the relationship of upper basin depletion to average streamflows, drought year streamflows, and the number of years navigation is suspended. The table shows that at an upper basin depletion of 1,625,000 acre-feet per year increase over the 1975 level, the 82-year average streamflow would be 20,221,000 acre-feet per year. However, the streamflows during the drought would average only 11,740,000 acre-feet per year, nearly 5 million acre-feet per year below the 16.4 million acre-feet requirement for full service navigation at Sioux City. Navigation seasons shortened to as low as 4 months would be necessary during the drought period.

As upper basin depletions reach 1,916,000 acre-feet per year, the average annual river flow at Sioux City would still be 19,988,000 acre-feet per year, but the average flows during the drought period would be 11,163,000 acre-feet per year. Navigation would be shut down during one year during the drought period. As upper basin depletions increase to 2,411,000 million acre-feet per year, the average annual flows at Sioux City drop to 19,501,000 acre-feet per year. The drought period average

TABLE III-22 MISSOURI RIVER FLOWS AT SIOUX CITY, IOWA

Scenario	Increased Upper Basin Depletion (1000 A-F/yr)	Average Annual River Flows At Sioux City: Average Conditions (1000 A-F/yr)	Average Annual River Flows At Sioux City: Drought Conditions[1] (1000 A-F/yr)	Number of Years Navigation Shut Down[2]
1975 Level	0	21,725	13,849	0
1A*	1,625	20,221	11,740	0
2B*	1,916	19,988	11,163	1
1B	2,411	19,501	10,599	3
1C*	3,218	18,662	9,858	3
3A	3,509	18,404	9,337	4
Requirement of Current Operation	-----	16,414 [3]	------	0

[1]Nine-year consecutive drought period.

[2]From computer operation studies, U.S. Army Corps of Engineers, Missouri River Division, Reservoir Control Center.

[3]Nominal requirement for 6,000 cfs absolute minimum flows during the four-month, nonnavigation season and 31,000 cfs for eight-month full service navigation season.

flows drop to 10,599,000 acre-feet per year, and navigation must be shut down for three years during this drought period. (See Table III-22.)

A conclusion from this analysis is that there is not enough carry-over storage in the main stem dams to sustain navigation during an extended (9-year) drought period when the upper basin depletion increases beyond about 1.6 to 1.7 million acre-feet per year over the 1975 level of development. (However, at this increased level of development, there will be periods of excess streamflows in the Missouri River at Sioux City.) This is the "threshold" level of development beyond which there is a risk that navigation cannot be sustained. The estimated probability of a 9-year drought similar to the 1932 - 1942 drought is only 2 to 3 percent. (More detailed studies are necessary to verify the exact probability.) This translates into an estimated 2 to 3 percent chance that navigation will be shut down one or more years if the upper basin depletions exceed 1.6 to 1.7 million acre-feet per year.

When increased upper basin depletions exceed about 3.3 million acre-feet per year, navigation service will be shut down more than three years during an extended drought period. At this level of development, river flow at Sioux City, Iowa, will average over 18 million acre-feet per year for the 82-year period of record. However, the average drought period flow will be less than 10 million acre-feet per year.

The bottom line regarding navigation is the risk of the recurrence of extreme drought. Tables III-20 and III-21 show that extensive navigation seasons can be provided past the year 2020 with normal or above normal river flows, that is, absent a drought.

System Operation for Hydropower

The O'Mahoney-Milliken Amendment provides that navigation should not be maintained at the expense of upstream consumptive uses. It could be suggested that when upper basin depletions exceed the threshold of potentially affecting navigation (1.6 to 1.7 million acre-feet per year), different main stem reservoir operating criteria should be established. Such criteria might emphasize hydroelectric power. In fact, navigation might be carried out until a drought occurs, and then be completely shut down, with operations shifted to the hydroelectric function. One consideration in a new operating criteria might be to increase generation during a drought.

Specific operating studies to investigate this possibility were not run because the probable outcome of such criteria can be qualitatively ascertained. The mainstem Missouri River reservoir system contains

74,373,000 acre-feet of total capacity. A total of 34,861,000 acre-feet of capacity are allocated to exclusive flood control, flood control and multiple use, and inactive capacity. The remaining carryover multiple use storage capacity is 39,512,000 acre-feet. The capacity is equivalent to two to three years inflow if the carryover pool were full at the beginning of the drought. Counting the expected inflow, system evaporation, and other losses, in a drought the system could be operated with water releases lower than the normal navigation level, but higher than what would be necessary to sustain the navigation operation. Under such an operating condition, the hydropower production would apparently be higher than under the navigation operations during the drought period indicated in Tables III-20 and III-21.

To operate the reservoir system to conserve water for the drought, however, would require maintaining higher reservoir levels preceeding the drought to insure the carryover storage. The result would appear to reduce the power system operating flexibilities for meeting power loads. The operation of the system to increase power during the drought period would likely result in less power generation on the average.

Analysis of optimizing system operation for hydropower production would require knowing the future average and peak loads by seasons and determining optimal release schedules to cope with icing conditions, desired river fluctuations, and capabilities versus generation requirements. While it is probable that the system could be operated to optimize power generation under a strict hydropower operational criteria, it appears that operational adjustments to enhance hydropower production during the drought will primarily result in lowering the total average generation output of the system.

CONCLUSIONS

Continued water development in the Missouri River Basin will reduce streamflows in the main stem Missouri River. Assuming average hydrologic conditions, there will be a resulting reduction in the average length of navigation season each year, as well as a reduction in hydropower production from the six main stem reservoirs.

No water shortages are projected from the main stem Missouri River by the year 2000. Tributary water developments may experience seasonal water shortages, and depletion of aquifers will also deplete tributary streamflows, particularly in the Platte and Kansas River basins. These tributary shortages may be allocated among Colorado, Nebraska, and Kansas, but they would not seem to affect the Missouri River Basin as a whole.

Should a drought similar to the 1934-1942 period occur (2 to 3 percent chance of occurrence), navigation would be shut down for one year of the 9-year period for water development above the medium level of projection in either the upper or lower Missouri River Basin, assuming at least the low level of development occurs in the upstream and downstream areas of the basin. (See Table III-20.) If no drought occurs around the turn of the century, the actual impacts of the future water development would be felt only in terms of a reduction in the average navigation season; that is, the actual curtailment of navigation will not occur until a drought period and upper basin development is past the "threshold" depletion level. The threshold level of upper basin depletions beyond which navigation may not be possible during a severe drought is 1.6 to 1.7 million acre-feet per year.

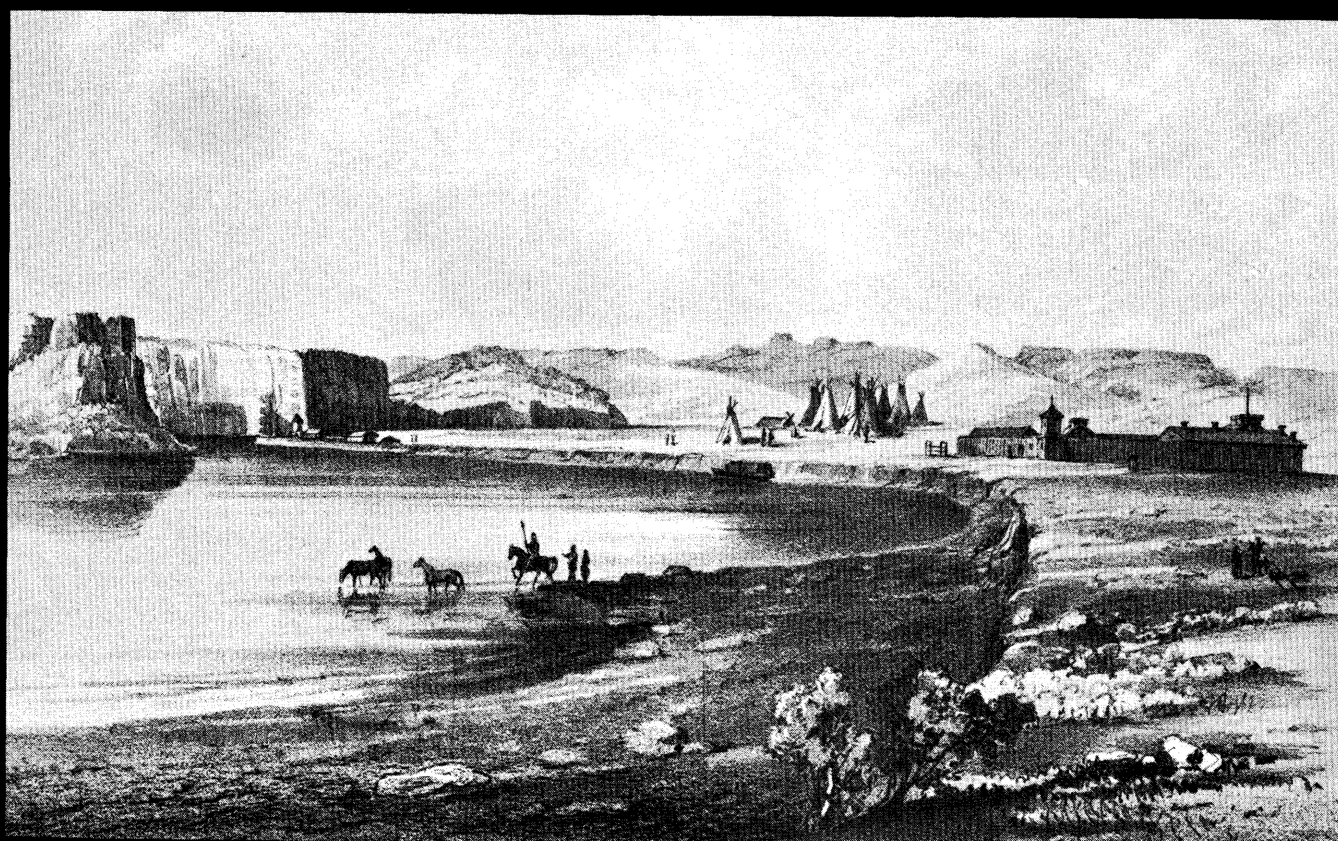
By the year 2020, even at the low upper basin and lower basin levels of water development, navigation would be suspended by a severe drought.

At a medium level of basinwide water development (or a high level of development above Garrison and low level of development below Garrison), navigation would be suspended as long as three years during a severe drought period. Such conditions would probably eliminate navigation as a viable economic enterprise.

In summary, the nature of the water use conflict will be reduction in navigation service and hydropower production, and river stage (environmental) effects.

LIST OF REFERENCES - CHAPTER III

See page II-41.



J. M. Stanley — 1853

FORT BENTON

CHAPTER IV

Economic Impact Analysis

CHAPTER IV - ECONOMIC IMPACT ANALYSIS

INTRODUCTION

There are important economic implications associated with interstate water allocation. Historically, water allocations were based on available water and land resources rather than cost-benefit ratios or highest and best uses. The water resources of each subbasin or state were weighed with other factors in the region which affect economic development (such as climatic conditions and the presence of other natural resources). This emphasis on equitable economic opportunity was intended to prevent areas from being disadvantaged economically and socially by the lack of water.

Most past water allocations have been based on consumptive uses. More recently, environmental considerations such as maintenance of water quality, also have been brought into water allocation.

These historic criteria are presented as background. This study does not suggest criteria for future water allocations in the Missouri River Basin. However, it does examine the economic returns, both to downstream states and to Montana, for various water use sectors. The data on economic returns are compared with the scenarios developed in Chapter III in order to identify the economic impacts of basin-wide water use conflicts. In turn, these data serve as the basis for the qualitative conclusions of this chapter and might be used as one basis for policy determinations on allocation criteria.

Because of the limited study budget, the scope of the economic impact analysis was limited to measures of direct, or first level, economic return for selected water using sectors. Consequently, caution should be used in treating the values derived in this analysis as being absolute measures of economic return to the sectors involved. Emphasis was placed on the economic factors for Montana. The secondary economic impacts, or the multiplying of direct economic benefits through the economy, are significant in all areas of the Missouri River Basin, but are only discussed for Montana.

Economic evaluation parameters were developed for the following water using sectors:

For Montana:

Irrigation
Energy/coal

For Other States:

Irrigation
Navigation
Hydropower
Interbasin Development

An economic parameter for instream flows for Montana was not developed for the following reason: Montana has been concerned about instream values and has allocated water for instream use through the reservation process. If Montana chooses instream flows rather than depletive water development, and helps maintain downstream river flows, the economic returns of Missouri River commercial navigation will be enhanced. If Montana water development for consumptive uses is reduced specifically to provide for in-state instream flows, there would be internal economic trade-offs between the benefits from consumptive water use and instream flows for hydropower, water quality maintenance, fish, wildlife, recreation, and aesthetics. However, the implications of Montana's internal decisions on instream flow allocations are outside the scope of this interstate water allocation study.

ECONOMIC PARAMETERS

The following subsections describe how the economic parameters were developed for each water-using sector, including irrigation, energy/coal, navigation and hydropower. The gross returns from irrigation are summarized in this section of the report for the basin as a whole. The value of hydropower is a total for the entire production of the six main stem power plants. Although a portion of this hydropower is used in Montana, the Montana share was not distinguished.

Recent development trends in the important water-using sectors were summarized in Chapter II. These recent water development trends were considered in deriving projections of future economic activity and associated Missouri River Basin water depletions. As described in Chapter III, projections were developed for low, medium, and high levels of future water development.

Several tables in Chapter III are important to the development of economic parameters. These include Table III-2, Summary of Irrigated Acreage Projections, Table III-9, Projected Montana Coal-using Plants, and Table III-10, Projected Montana Coal Mining Connected with Plant Use.

Irrigation

It was necessary to develop a parameter to measure the value of irrigation that could be applied in all the Missouri River Basin states. Due to the limited scope of the economic impact analysis, the parameter chosen was the gross value of crop sales that would be realized over the 1975 level of development. The gross crop sales per acre can be derived from the Pick-Sloan Missouri River Basin projects statistics published by the U.S. Bureau of Reclamation (Appendix One of the Annual Report of the Bureau of Reclamation).

The Bureau data for the Pick-Sloan Missouri River Basin projects were summarized by states. Data for the year 1979, the latest available, were utilized as the current gross crop value (see Table IV-1). In order to determine if the Bureau crop value data are representative of average production and crop prices, Wyoming and Montana county statistics on irrigation yields, prices received, and derived gross value were checked. Table IV-2 presents this data. It is seen that gross value of production on irrigated lands in Montana averages \$156.02 per acre according to the county data, and \$174 per acre according to the Bureau of Reclamation data. These values compare within 10 percent. Considering the different sources of data and the fact that the Bureau data only include federal projects, the figures compare reasonably well. The Wyoming county data show a weighted gross value of \$199.39 per acre, while the Bureau of Reclamation data show \$201 per acre. Because of these close comparisons it is believed that the Bureau of Reclamation information will provide a constant gross value of production per acre on newly irrigated land.

The Montana gross value of crop sales per irrigated acre of \$174 derived from Bureau of Reclamation data and the \$156 derived from county data may appear to be low. However, the Bureau figure is the weighted average per acre for all irrigated land reported in Montana. The gross value of crop sales per irrigated acre varies considerably throughout Montana. For example, for the Lower Yellowstone River projects -- Buffalo Rapids, Huntley, Intake, Crow Creek, Savage, and Lower Yellowstone -- the weighted average gross crop sales per acre is \$300. For the upper Missouri projects -- Milk River, East Bench, Helena Valley, Lower Marias, and Sun River -- the weighted value per acre is \$137.

It must be realized that the gross value of crop sales is not necessarily indicative of the cost-benefits of irrigation. For example, a net increase in income to farmers and ranchers would be derived by subtracting the expenses incurred in producing crops from gross returns. Also, the gross sales figures do not include the multiplier effects of the expenditures by farmers and ranchers in other sectors of the economy, or

TABLE IV-1 GROSS CROP VALUE, VALUE PER IRRIGATED ACRE, AND CUMULATIVE GROSS CROP VALUE, BY STATES (1979)

State	Total Gross Crop Value	Average Value Per Irrigated Acre
	(Thousands)	
Colorado	$298,016	$ 342
Kansas	15,617	275
Montana	61,047	174
Nebraska	156,203	317
North Dakota	10,704	355
South Dakota	11,740	156
Wyoming	75,910	201
TOTAL	$629,237	

Source: U.S. Bureau of Reclamation, 1979 Annual Report, Crop and Related Data.

TABLE IV-2 WEIGHTED GROSS CROP VALUES PER IRRIGATED ACRE BASED ON COUNTY STATISTICAL DATA

Montana

Crop	Acres	Weight	Yield	$/Unit	Weighted Gross Value Per Acre
Spring Wheat	58,000	.061	48.6	3.05/bu	9.04
Barley	202,700	.213	59.3	1.97	24.88
Corn-Silage	65,200	.068	14.0	15.57/T	14.82
Corn-Grain	5,000	.005	77	2.42	.93
Sugar Beets	43,400	.046	19.1	31.82	27.96
Dry Beans	9,700	.010	19.0	20.97	3.98
Oats	28,500	.030	59.00	1.30	2.30
Alfalfa	540,375	.567	2.45	51.91	72.11
	952,875				156.02

Wyoming

Crop	Acres	Weight	Yield	$/Unit	Weighted Gross Value Per Acre
Alfalfa	368,000	.548	2.89	50.63	80.18
Corn-Grain	28,500	.042	87.9	2.32	8.56
Sugar Beets	48,200	.072	18.8	31.45	42.57
Wheat	10,500	.016	42.3	2.92	1.98
Barley	108,500	.162	68.4	2.53	28.03
Oats	26,900	.040	56.9	1.35	3.07
Dry Beans	28,000	.042	19.0	21.30	17.00
Corn-Silage	53,000	.079	15.0	15.19	18.00
	671,600				199.39

Source: Wyoming Crop and Livestock Reporting Service, 1980, Wyoming Agricultural Statistics.

the revenues derived by secondary agricultural enterprises and industries.

The values associated with the development of water for irrigation under the low, medium, and high projections were based on figures for increased irrigated acreages (Table III-2) and the gross crop values (Table IV-1). For the river reaches of the Missouri Basin, the value of future irrigation development in terms of gross value of crop sales is given in Table IV-3 for each of the low, medium, and high projection levels. Values for Montana are given separately. These data show the increase in farm sales as a result of irrigation development beyond the 1975 level.

It can be seen that for the year 2000 the increase in gross crop sales would range from $31.8 million per year for the low projection to $100.6 million per year for the high projection. This compares with a $272.3 million increase in gross crop sales per year for the entire upper Missouri River Basin above Sioux City, Iowa, for the high projection level; $1,353.4 million per year for the lower Missouri River Basin; and $1,625.7 million per year for the entire Missouri River Basin. Similar comparisons can be made of the annual increased value of agricultural production for each of the future target years at the indicated level of irrigation development.

Increased economic activity is one example of the secondary benefits of increased irrigation in Montana. For the year 2000 medium projection level, the increase in gross crop sales would be about $65.4 million over the 1975 level. If the multiplier effect from the increased sales is included, the total economic activity generated by the increased irrigation for the year 2000 would be approximately doubled, or about $130 million.

In addition to the increased value of crop sales, tax revenues generated by irrigated acreage would be higher. The incremental tax increase would be the taxes generated on irrigated land, less the taxes that would have been generated on range lands, times the increase in the irrigated acres. In Montana the incremental tax revenue increase for converting grazing land to irrigated land is $5.07 per acre per year[1]. For the projected medium level of 376,000 acres of new irrigation for year 2000, the increased taxes collected would be $1.9 million.

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[1] In Montana agricultural land is assessed at 30 percent of its production capacity. The statewide average assessed value for irrigated land is currently $32.14 per acre and the average assessed value for grazing land is $3.56 per acre (Department of Revenue, 1980). The resulting dif-

TABLE IV-3 PROJECTED INCREASED GROSS VALUE OF CROP SALES OVER 1975 LEVEL, MISSOURI RIVER BASIN

Millions of Dollars Per Year

River Reach	1975-1990 Low	1975-1990 Med	1975-1990 High	1975-2000 Low	1975-2000 Med	1975-2000 High	1975-2020 Low	1975-2020 Med	1975-2020 High	1975-2040 Low	1975-2040 Med	1975-2040 High
Above Fort Peck	5.9	13.9	32.0	13.9	32.0	50.1	32.0	50.1	64.0	50.1	64.0	82.1
Fort Peck to Garrison												
Montana	10.8	20.0	30.5	17.9	33.4	50.5	25.1	44.0	57.9	44.0	75.9	66.3
(Subtotal Montana)	(16.7)	(33.9)	(62.5)	(31.8)	(65.4)	(100.6)	(57.1)	(94.1)	(121.9)	(94.1)	(121.9)	(148.4)
Wyoming-North Dakota	16.2	28.8	39.9	47.4	78.6	117.9	109.7	141.6	168.5	141.6	168.5	358.9
Fort Peck-Garrison TOTAL	27.0	48.8	70.4	65.3	112.0	168.4	134.8	185.6	226.4	185.6	226.4	425.2
Garrison to Oahe	6.3	12.8	19.0	26.6	28.8	32.8	47.1	66.5	89.4	80.6	115.0	175.9
Oahe to Gavins Point	1.0	1.0	1.0	4.8	9.8	9.8	32.1	32.1	32.1	41.7	41.7	41.7
Gavins Point to Sioux City	9.4	9.4	9.4	11.2	11.2	11.2	37.4	37.4	37.4	46.8	46.8	46.8
Sioux City to Omaha	53.0	63.4	75.8	75.8	102.1	128.4	102.1	128.4	225.0	128.4	225.0	264.0
Omaha to Nebraska City	294.5	347.1	431.4	347.1	431.1	665.7	431.4	665.7	665.7	665.7	665.7	665.7
Nebraska City to Kansas City	175.7	249.5	312.7	248.4	310.7	383.0	310.6	383.0	668.2	383.0	668.2	705.0
Kansas City to Boonville	31.3	50.0	67.3	50.0	67.3	104.8	67.3	104.8	169.6	104.8	169.6	187.7
Boonville to Hermann	20.6	34.4	48.1	34.4	48.1	71.5	48.1	71.5	121.6	71.5	121.6	151.3
(Montana)	(16.7)	(33.9)	(62.5)	(31.8)	(65.4)	(100.6)	(57.1)	(94.1)	(121.9)	(94.1)	(121.9)	(148.4)
Total above Sioux City	49.6	85.9	131.8	126.8	193.8	272.3	283.4	371.7	449.3	404.8	493.9	771.7
Total below Sioux City	575.1	744.4	935.3	755.7	959.3	1353.4	959.5	1353.4	1850.1	1353.4	1850.1	1973.7
TOTAL	624.7	830.3	1067.1	882.5	1153.1	1625.7	1242.9	1725.1	2299.4	1758.2	2344.0	2745.4

Montana Energy/Coal

The common parameter of local and state tax revenues was used to measure the economic impact of alternative levels of development in the energy/coal sector. Values for future local revenues were derived from the projected coal-using plants shown in Table III-9. These include thermal-electric, synfuel, synthetic natural gas, and fertilizer plants which might be developed in the Yellowstone and upper Missouri basins in Montana. State and local tax revenues were also derived from coal mining activities connected with plant use. Tonnages for the various projection levels are shown in Table III-10.

Ad Valorem/Severance Taxes on Coal. Montana has two production taxes on coal--the severance tax and the Resources Indemnity Trust tax (RIT). The severance tax rates (see Table IV-4) are the greater of a tax per ton or a percentage of "contract sales price" (Voelker, 1981); that is, the price F.O.B. (free on board) less federal and state production taxes, RIT, and the gross proceeds portion of the general property tax.

The RIT tax is an annual levy against each mining firm of $25, plus 0.5 percent on the gross value of product in excess of $5,000 per year. In the case of coal mines, the tax base is contract sales price, less certain deductions for costs incurred in getting the coal from the mine mouth to the rail cars.

The proceeds of the Resource Indemnity Trust tax are placed in a special state fund which is available for investment. When this fund reaches $10 million, interest earnings may be appropriated to rectify and prevent environmental damage. When the fund reaches $100 million, the RIT tax revenues, as well as interest earnings, can be appropriated by the legislature, provided the balance does not fall below $100 million.

The Montana legislature has changed the apportionment of the proceeds of the coal severance tax several times, but over the years 74 percent or more went into four funds -- state constitutional trust fund,

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ference in assessed value is $28.58 per acre. The assessed value is then multiplied by an average mill levy. Four of the primary counties where expanded irrigation would be developed in Montana are Garfield, Golden Valley, Musselshell, and Yellowstone. The average levy in mills for state, county, and school taxes in these counties is 177.57. Taking the difference in assessed value of $28.58 per acre times the mill levy of 177.57 gives the tax revenue increase of $5.07 per acre for converting grazing land to irrigated land.

TABLE IV-4 MONTANA SEVERANCE TAX RATES ON COAL, 1979

Btu's Per Pound	Surface Mines		Underground Mines	
	Cents Per Ton	Percent of Value	Cents Per Ton	Percent of Value
	-- the greater of --		-- the greater of --	
Less than 7,000	12	20	5	3
7,001 to 8,000	20	30	8	4
8,001 to 9,000	34	30	10	4
9,001 and over	40	30	12	4

state general fund, local impact fund, and education trust fund. The percentage distribution of the severance tax during fiscal year 1981 is shown in Figure IV-1.

Property Taxes on Coal. In Montana, the Division of Property Valuation of the State Department of Revenue is responsible for all assessment work. All operating properties of railroads and other public utilities are assessed by the central office of the Department. The actual appraisals for other types of property are made by county assessors and state appraisers, who are stationed at county seats and operate under state guidelines and supervision.

Montana uses a classified property tax system. The taxable values of 11 different classes of taxable property vary from 3 to 100 percent of fair market value. The most important classes of property associated with coal mines, together with their taxable values expressed as percentage of market value, are as follows:

Class II -- Underground coal mines: annual gross proceeds assessed at 33 1/3 percent of market value. Coal strip mines: annual gross proceeds assessed at 45 percent. The value of gross proceeds is the same as the contract sales price used for the coal severance tax, described above.

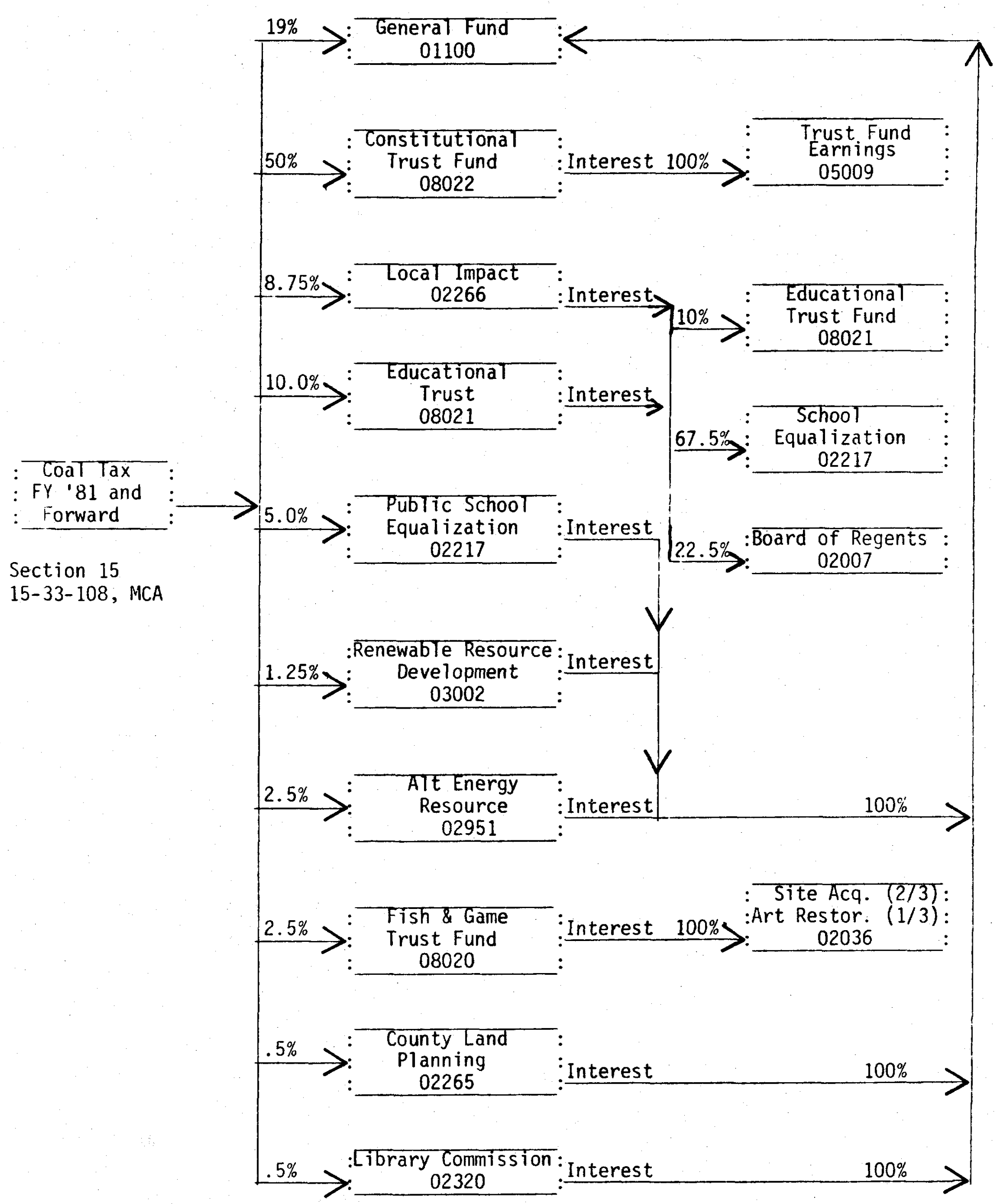
Class IV -- All lands and improvements, except those specifically included in other classes: 8.55 percent. Mining property in this class includes office buildings, tipples, warehouses, shops, garages, storage facilities, parking lots, and the industrial site on which these structures and facilities are located.

Class V -- Air and water pollution control equipment: 3.0 percent. The most important coal mining equipment in this class includes the dust-suppression devices on tipples, crushers, and coal preparation equipment.

Class VIII -- All mining and manufacturing machinery, fixtures, equipment, tools, and supplies (except that specifically included in Class V, Class IX, and Class X): 11 percent. Fair market value of machinery and equipment is based on depreciated cost, year of purchase, and assumed life of each type. The "Green Guide" is used for mobile equipment and machinery wherever possible.

Class IX -- Automobiles, buses, and trucks with rated capacities of 1 1/2 tons or less; citizen band radios and mobile phones; and office furniture and equipment: 13 percent. This class includes personnel vans,

FIGURE IV-1 COAL SEVERANCE TAX DISTRIBUTION



pickups, and most service trucks. The average retail values in the "N.A.D.A. Official Used Car Guide" are used for automobiles.

Class X -- Coal and ore haulers, trucks with rated capacities greater than 1 1/2 tons, and all other property not included in the preceding classes: 16 percent.

State Production Taxes on Electric Generating Plants. This tax applies only to net station output; that is, electricity used internally in the generating process such as for light, heat, fans, pumps, coal pulverizers, conveyors, electrostatic precipitators, and flue gas desulfurizing devices is exempt. The tax is 0.2 mills per KWH of net production of both hydroelectrical and steam generating plants. The tax is in addition to any property taxes or corporate license taxes for which the company may be liable. The production tax is paid quarterly, and all proceeds are credited to the state's general fund.

Local Property Taxes Paid by Coal Conversion Plants. The 1979 session of the Montana legislature made several important changes in the statutory provisions for assessing public utilities. All property of public utilities is now centrally assessed by the Department of Revenue. The wording of the revised statutes implies that the Department will establish an overall or "unitary" value for each company, but the statutes leave it to the Department to develop the necessary appraisal methods and procedures for accomplishing this. With one exception, all operating property of electric power companies is included in Class XI, which has a taxable valuation of 12 percent of assessed or "market value."

The procedure adopted by the Department of Revenue begins with a determination of the total unitary value of each company by three different methods: (1) depreciated construction costs; (2) estimated future annual net income at some predetermined rate (for example, a capitalization rate of 10 1/2 percent was used in 1979); and (3) market analysis of the company's stocks and bonds. An average of these three values, in which the first two are given somewhat higher weights than the third, is then computed. The estimated value of property located outside the state is then deducted to derive the total Montana unitary value.

The statutes provide that equipment for air and water pollution control be included in Assessment Class V, which has a taxable valuation of only 3 percent of market value. To qualify for this low assessment rate, however, the approval of the State Department of Health is required. Pollution control equipment at coal-fired electric generating plant include electrostatic precipitators, flue-gas scrubbers, and other flue-gas

desulfurizing devices. It is not known whether the Department of Health would approve facilities for purifying cooling water and wastewater before discharging them into a water course.

The next step is to apportion the total Montana taxable valuation of each utility company among the taxing jurisdictions within which it operates. The statutes provide that this apportionment may be either on a line-mileage basis, or on the basis of the original installed cost of the property located in each governmental unit. If the property is of such a character that its value cannot reasonably be apportioned by either the line-mileage or installed-cost basis, the Department of Revenue may devise some other just and proper method.

In the case of electric utility companies, the Department has decided to use a combination of the line-mileage and installed-cost apportionment methods. The taxable value of electric generating facilities, both hydroelectric and thermal electric, is basically installed cost, which in some cases may be adjusted for depreciation or inflation. This value is apportioned to the county, school district, and any other taxing jurisdiction within which each plant is located. The total unitary value of the company, less the taxable value of generating facilities, is then apportioned on a line-mileage basis among all taxing jurisdictions within which the company operates. For socio-economic impact studies, a staff member of the Montana Department of Revenue suggests that estimated construction costs, without adjustment, be used as the basis for estimating the taxable valuation of new or proposed coal-fired electric generators, at least for the first few years of operation.

<u>State Sales Tax.</u> Montana does not have a sales tax.

<u>Corporate Income Taxes.</u> Montana's corporate income tax closely follows the federal definition of corporate income. The tax rate is 6.75 percent.

<u>Revenues from Projected Coal Development.</u> Projections of coal development in terms of the conversion plants in Table III-9 were used to determine the projected levels of capital investment and local tax revenues (see Table IV-5). The figures shown are the increase in annual tax revenues over 1975 values. Local revenues from coal were estimated using an effective property tax rate of 119 mills (White, et al., 1979).

Montana's severance tax is producing state revenues of about $100 million annually. The coal severance tax per ton has increased with coal prices in accord with Montana law: FY 78, average of $1.64; FY 79, $1.47-$1.78; FY 80, $2.07-$2.37; FY 81, $2.05-$2.48; last quarter of

TABLE IV-5 PROJECTED LEVELS OF CAPITAL INVESTMENT IN MONTANA COAL PLANTS AND LOCAL TAX REVENUES (UPPER MISSOURI AND YELLOWSTONE) (MILLIONS OF 1981 DOLLARS)[1]

Year	Projection Level	Thermal Electric	Synfuel	SNG	Total	Local Revenue
1990	Low	1,500	0	0	1,500	17.9
	Medium	2,700	0	2,747	5,447	64.8
	High	5,100	0	2,747	7,847	93.4
2000	Low	4,100	5,036	2,747	11,883	141.4
	Medium	7,700	10,072	5,200	22,972	273.4
	High	8,700	15,108	10,106	33,914	403.6
2020	Low	7,700	10,072	5,200	22,972	273.4
	Medium	8,700	15,108	10,106	33,914	403.6
	High	17,200	20,144	17,465	54,809	652.2
2040	Low	8,700	15,108	12,559	36,367	432.8
	Medium	20,200	25,180	17,465	62,845	747.9
	High	24,200	35,252	29,730	89,182	1061.3

[1] Increase over 1975 development and revenues.

1981, \$2.68. Local coal taxes for 1978 were \$0.09 per ton. The combined rate of state and local taxes used for estimates in this report is \$2.77 per ton. Table IV-6 shows the estimates of state and local revenues from coal mining associated with the projected coal conversion plants for the low, medium, and high projection levels.

Projections of combined state and local tax revenues from energy plants and associated coal mining are shown in Table IV-7.

Employment Increases from Projected Coal Development (Secondary Impact). The projected levels of coal development would require a large work force by the year 1990 in the Yellowstone River Basin and in the Montana portion of the Upper Missouri River Basin by 2000. Most of the employment increases would be temporary during construction of mines and conversion plants. The degree to which future coal development would result in population increases depends on many factors, including local multiplier effects, labor force participation rates, the demographic composition of the population, and the extent of commuting (Bender et al., 1980).

The labor for constructing coal conversion plants tends to be highly technical and specialized. This is less the case with plant operation. In a comparative review of impact studies, it was concluded that at first, synfuel plants will demand high levels of construction skills; in the first year, the entire work force will be composed of engineers and other professionals. In later years, about 75 percent of the work force will consist of pipefitters, electricians, carpenters, ironworkers, and boilermakers. About 15 to 30 percent will be workers such as welders, heavy equipment operators, and asbestos workers; about 10 percent will be laborers. Because of job skill demands, it is unlikely that a coal conversion project will provide many jobs for local residents. Plant construction requirements also will create a high job turnover. Professional and technical workers peak in number the first year; later, blue collar workers steadily increase in number. However, shifts in occupational requirements cause turnover, even if the total number of workers remains relatively stable (Shillington, 1981).

Although work force estimates vary widely for coal conversion plants, an estimate of peak work force for a 250 million standard cubic feet per day (MMSCFD) high Btu gasification plant is 3,000-4,000 workers and 2,000-6,525 for a 100,000 barrels per day (bpd) liquefaction plant. The differences may depend upon the kind of plant being built. The work force would be expected to peak 3 to 4 years after construction begins, then level off into the operational phase.

TABLE IV-6 MONTANA STATE AND LOCAL REVENUES FROM COAL MINING CONNECTED WITH PLANT USE: ESTIMATES BASED ON THE SUM OF LOCAL PRODUCTION AND PROPERTY TAX AT $.09 PER TON PLUS STATE PRODUCTION TAXES AT $2.68 PER TON. (DOES NOT INCLUDE TAXES ON PLANT AND EQUIPMENT FOR COAL CONVERSION.)

Year	Projection Level	Total (mmt/y)	State & Local Revenues @ $2.77/T (Millions of $)
1990	Low	6.0	16.6
	Medium	19.3	53.4
	High	28.9	80.1
2000	Low	46.4	128.5
	Medium	86.4	239.3
	High	123.6	342.4
2020	Low	86.4	239.3
	Medium	123.6	342.4
	High	198.4	549.6
2040	Low	131.2	363.4
	Medium	190.8	528.5
	High	328.9	911.1

Reference for tax rate estimates: Bender, L.D., and V.W. House. 1979. Great Plains Coal: Background for Future Issues. Cooperative Extension Bltn. 1226. Montana State University, Bozeman, as revised by information from the Montana Department of Revenue.

TABLE IV-7 SUMMARY OF STATE AND LOCAL TAX REVENUES FROM PROJECTED MONTANA ENERGY PLANTS AND RELATED COAL MINING

Millions of Dollars

Year	Projection Level	Plant Related Taxes[1]	Coal Tax Revenues[2]	Total Revenues
1990	Low	17.9	16.6	34.5
	Medium	64.8	53.4	118.2
	High	93.4	80.1	173.5
2000	Low	141.4	128.5	269.9
	Medium	273.4	239.3	512.7
	High	403.6	342.4	746.0
2020	Low	273.4	239.3	512.7
	Medium	403.6	342.4	746.0
	High	652.2	549.6	1201.8
2040	Low	433.8	363.4	796.2
	Medium	747.9	528.5	1276.4
	High	1061.3	911.1	1972.4

[1]From Table IV-5

[2]From Table IV-6

Employment to operate a 250 MMSCFD would be about 600 workers, and about 1,200-1,500 workers for a 100,000 bpd liquefaction plant (Shillington, 1981).

The energy development projected in this report involves a mix of thermal electric, gasification, and liquefaction plants, as well as mines. Bender et al. (1980) estimated the population effects of an identical mix for Rosebud County for 1978-1990. Figure IV-2 shows the estimated effects on population. These estimates cannot be extrapolated to the whole state, but the pattern in other coal rich counties is expected to be similar. However, Montana Power Company's proposed thermal-electric plants near Great Falls would not produce as many new jobs as a similar sized project in eastern Montana because Great Falls is a city with considerable excess labor capacity. Thus, as development occurs, there, many of the jobs in support services will be absorbed by local residents and the rate of labor force participation will rise.

Navigation

Economic Parameters. The U.S. Army Corps of Engineers, Missouri River Division, recently initiated a review of the Missouri River Bank Stabilization and Navigation Project. Part of that study provides an estimate of navigation benefits. These benefits are the cost savings achieved from using this mode of transportation compared to the next least costly alternative.

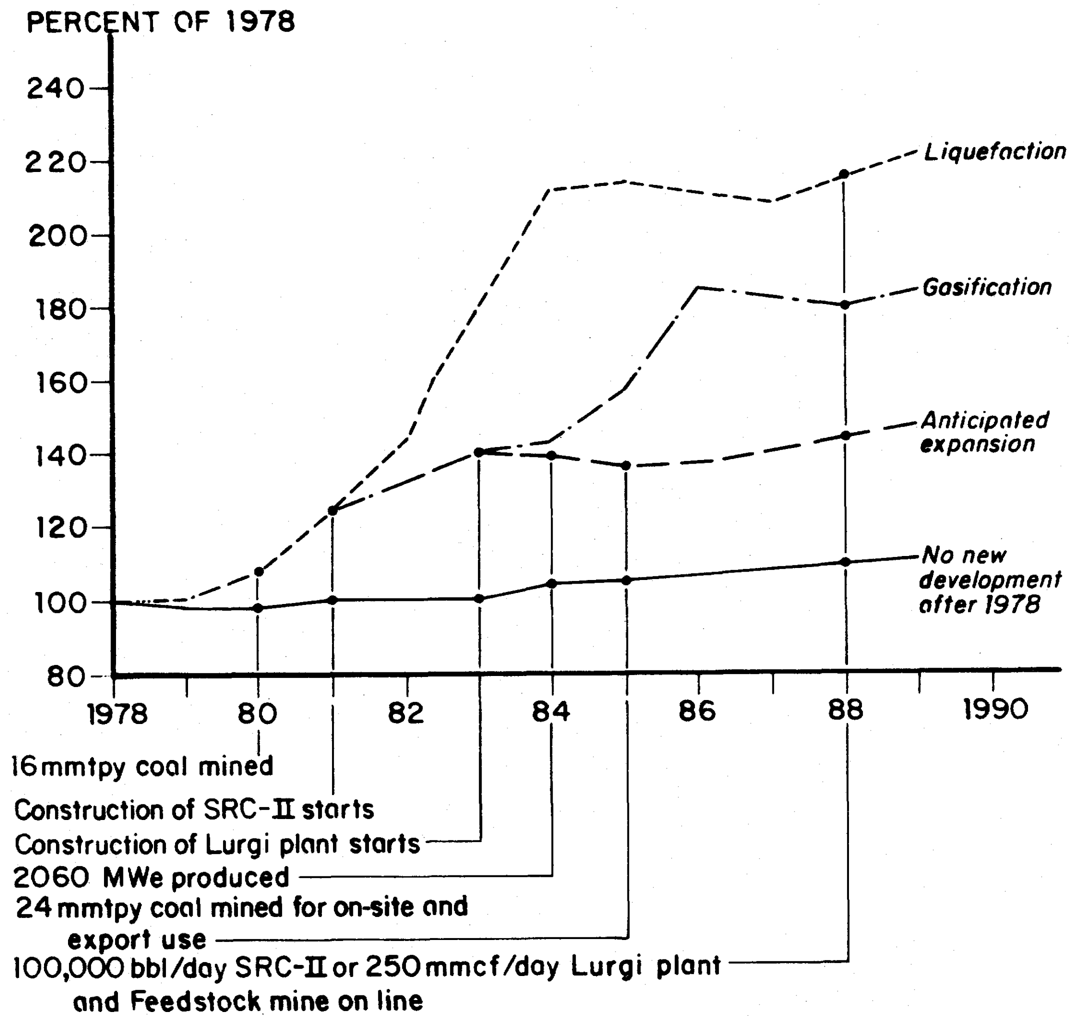
The Missouri River navigation channel runs from Sioux City, Iowa, to the river's mouth, with a continuous channel nine feet deep and at least 300 feet wide. Annual commodity movements during the first 12 years (1946-1957) ranged from 100,000 to 400,000 tons. During the next four years, shipped tonnage increased about four-fold, and from 1962 to 1975, shipments ranged from 2.1 to 2.8 million tons annually. Since 1975, annual shipments have ranged from 3.1 to 3.3 million tons over the 8-month navigation season (U.S. Army Corps Engineers, December, 1980).

The economic benefit of the Missouri River navigation waterway to the nation is the savings in resources from not having to use a more costly mode of transportation. Transportation savings are based on the costs of transporting each commodity via the waterway compared to the cost of the next least costly means of transportation.

For bulk commodities such as grain, fertilizer, petroleum, iron, and steel, the primary choice of transport is between barge or rail. When it is possible to use barges, they are almost always cheaper. In a recent navigation study, the Corps calculated rate differences between barge and

FIGURE IV-2

Indexes of Simulated Population Estimates 1978-1990
Rosebud County, and Assumed Energy Developments



Source: EDD/ESCS/USDA Energy Impact Team

rail which included any difference in handling charges. Table IV-8 gives the cost savings per ton for March, 1979 prices based on 1977 distribution of tonnage on the Missouri system. Estimated savings for the commodities moved on the Missouri River were \$6.80/ton. Multiplying that by the 3.26 million tons transported in 1979 provides about \$22.2 million in benefits from navigation in 1979.

For the period 1980 to 2080, the Corps also estimated yearly navigation benefits to the several states bordering the Missouri River. These average annual benefits amounted to \$20.7 million (U.S. Army Corps of Engineers, December, 1980).

Estimated savings for 1980 are lower because of significant changes in barge and rail rates between March 1979 and March 1980. Barge rates are generally indexed to the cost of diesel fuel, and increased fuel prices have led to an estimated 40 percent increase in barge rates. During this same period, rail rates increased an average of 20 percent in response to fuel costs. This difference in rate increases caused the Corps to change their per unit savings from \$6.80 to \$6.00/ton.

Further adjustments were needed to reflect new volume rates for wheat. Introduced in late 1979, these adjustments reduced rates 15 to 30 percent on much of the grain traffic. Since wheat is the primary farm product, the Corps reduced estimated waterway savings further from \$6.00 to \$5.30/ton.

A final adjustment on cost savings was necessary to account for the fuel tax levied on water users by PL95-502. A tax of 4¢ per gallon on fuel used by towboats became effective October 1, 1980. The 4¢ tax caused the Corps to reduce its barge cost savings another 30¢ to \$5.00/ton. Taking the \$5.00/ton cost savings for 1980, times the 1979 tonnage of 3.26 million tons, results in a 1980 navigation benefit of \$16.3 million.

Six projections of future traffic level on the Missouri were developed for the Corps. However, none were accepted by the Corps as being reasonable (Corps, 1980). The Corps modified one of the projections to arrive at an acceptable estimate of future tonnage. Based upon this annual projected tonnage and the savings of \$5.00/ ton in 1980, benefits from navigation can be estimated. These benefits for specified years are shown in Table IV-9.

This data suggest that annual benefits will range from \$17 to \$25 million between 1980 and 2030. If upstream depletions shut down navigation on the Missouri, these benefits would be lost. If barge traffic is

TABLE IV-8 MISSOURI RIVER TRANSPORTATION SAVINGS PER TON, 1979

	Tonnage (1979)	Rate Savings	Total Savings
Farm Products	49%	$ 6.10	$ 2.50
Food and Kindred	16%	15.38	10.15
Chemicals	17%	14.54	13.10
Stone, Clay, Nonmetallic Minerals	11%	8.44	10.00
Petroleum	4%	11.14	3.65
Iron, Steel, Scrap	3%	19.25	15.60
Weighted Average	100%	$ 9.92	$ 6.80

Source: U.S. Army Corps of Engineers, Missouri River Division, December 1980, Missouri River Bank Stabilization and Navigation Project Economics.

TABLE IV-9 PROJECTED MISSOURI RIVER NAVIGATION TONNAGE AND ASSOCIATED SAVINGS[1]

1980	1990	2000	2030	2080
	(Annual Tonnage Millions)			
3.40	4.11	4.81	5.00	0
	(Annual Cost Saving Millions)			
17.0	20.6	24.1	25.0	0

Source: U.S. Army Corps of Engineers, Missouri River Division, December 1980, Missouri River Bank Stabilization and Navigation Project Economics.

[1]Corps of Engineers study selected projection (I-80) with inferred assumption that frequent years of zero navigation in a drought period will not occur until after the year 2030.

lost, it is quite possible that rail rates would increase, thereby creating an even larger loss in benefits. On the other hand, if user fees for barges increase, the navigation benefits would decrease.

Economic Impact of River Depletion on Navigation. Under current conditions, low flows cause cutbacks and/or reduced seasons in navigation service. The 8-month navigation season on the Missouri River depends upon the quantity of water stored in upstream reservoirs, the anticipated runoff, and, to some extent, tributary inflows downstream of the reservoirs.

An 8-month navigation season is the objective of reservoir regulation on the Missouri River. Based on experience, the Missouri River Division of the Corps of Engineers indicates that the following minimum flow levels are necessary to maintain navigation at a minimum service level: Sioux City and Omaha, 25,000 cfs; Nebraska City, 31,000 cfs; and Kansas City, 35,000 cfs. The Corps indicates that under present levels of depletion the minimum flow levels and, consequently, minimum service level, can be maintained in approximately 3 out of 4 years without release from storage. When these minimum flow levels occur, dredging is required to maintain satisfactory navigation, and a relatively high incidence of groundings can be expected. Based on numerous studies and actual experience with the navigation channels, the Corps operates the river with flows 6,000 cfs greater than minimum flow levels to provide "full service" levels for navigation.

In the Pick-Sloan plan, downstream navigation is subordinate to upstream water depletion. This preference is stated in the O'Mahoney-Milliken Amendment [Section 1(b)] of the 1944 Flood Control Act (see Chapter II).

Since the navigation season depends on water availability, increased depletions will affect navigation on the Missouri River. However, the change will not be dramatic; it will occur slowly as docking facilities are not repaired and as barges transfer to the Mississippi and Ohio river systems (U.S. Army Corps of Engineers, December, 1980).

Computer studies of future water development scenarios reported in Chapter III provided data on future navigation. The average full service navigation season and number of years that navigation cannot be provided are tabulated in Tables III-20 and III-21. Analysis of Corps of Engineers economic studies indicate that the full annual navigation benefit could be assumed for the years 2000 and 2020 so long as: (1) there is no severe drought; (2) increased depletions in the upper basin do not exceed 4.7 million acre-feet per year over 1975 levels; and (3) the average

navigation season was not less than 6.9 months. Seventy-five percent of the full-season navigation benefit was assumed for a 6-month average season and an upper basin increased depletion level of 5.5 million acre-feet. It should be emphasized that the data did not take the occurrence of severe drought into consideration. A severe drought would suspend navigation if upper basin depletions increased by an amount level of about 1.6 to 1.7 million acre-feet.

Hydroelectric Power

Hydroelectric power produced by plants at each of the six main stem Missouri River dams is marketed by the Western Area Power Administration (WAPA). Power produced at other dams, including Yellowtail on the Big Horn River and Canyon Ferry on the upper Missouri River, is also marketed by the WAPA.

One identifiable consequence of the diversion and depletion of water is the loss of hydroelectric power. The electricity not produced by hydroelectric plants can be generated by alternative means. However, the price of power generated by these alternatives will be higher than the price of hydroelectric power from existing dams. Utilities that now pay WAPA about six mills per kilowatt hour (KWH) would have to either cut back on demands or find much more expensive substitutes.

The WAPA sells most of its power to municipal electric utilities, public agencies, cooperatives, and other nonprofit organizations. These sales are to "preference customers," and the price is extremely low -- about 6 mills per KWH. The total amount of firm power WAPA is willing to sell to preference customers is based on power marketing studies that take into account low-flow years. Because the sales are firm contracts, when low flow occurs and hydropower production is reduced, WAPA must still provide power to the customer. Thus, WAPA must purchase power and deliver it to its customers at the contracted price.

This means that in most years the system will generate more power and has more kilowatt hours of capacity available than it commits to preference customers. This electricity is sold for maintenance and replacement services. Maintenance power is sold on a first come, first serve basis with priority given to preference customers. It is sold at a price of 10 mills per KWH. Replacement power is sold to all companies at very close to the existing market price.

The value of substitute power varies, depending upon the production costs of available alternatives. For example, in the late 1950's several generation and transmission cooperatives realized their demands for power

would quickly exceed available hydroelectric power. As a result, they organized Basin Electric as a regional cooperative. Rates for Basin Electric sales were approximately 30 mills per KWH in 1981 (Osterberg, 1982). This rate is assumed to be the market price for electric power.

The cost of cutbacks -- or the value of the reduced kilowatt hours -- requires knowing which customers would not receive power if future depletions reduce power production. In 1980, approximately 13.9 percent of the power sold by the Billings area office of WAPA was sold to investor-owned utilities. Since this power was priced near the market price (see above), any revenue lost here would be minor, and no attempt is made to assess it. One percent of the WAPA power is maintenance power sold to preference customers at 10 mills. It is assumed that the remaining 85.1 percent of the power is sold to preference customers at 6 mills per kwh.

As upper Missouri River Basin water depletion increases, there will be a reduction in hydropower produced. Municipal utilities and rural electric cooperatives would be faced with obtaining the lost power at a higher price. Their cost would be the higher rates for the alternative source of electricity less WAPA's present rate multiplied by the kilowatt hours lost. For example, if Basin Electric rates are used, each kilowatt lost would cost a utility receiving hydropower about 24 mills per KWH. (30 mills per KWH - 6 mills per KWH = 24 mills/KWH -- the cost differential).

The results of the computer model operation studies on the development scenarios include values for hydropower production which are used to determine the economic impact of alternative water allocation. The value of hydropower production is determined by multiplying the kilowatt hours (see Tables III-20 and III-21) times the cost differential of 24 mills per KWH. These impacts are shown later in the report.

Interbasin Diversions

The future water development scenarios include several interbasin diversion possibilities. The Garrison Project in North Dakota includes diversion of water from the Missouri River for irrigation of lands outside of the Missouri River Basin in the Souris River and Red River of the North basins. The economic impact of alternative levels of development in this project is included within the gross crop values for new land irrigation in the Fort Peck to Garrison River reach. All of the direct economic impacts of the Garrison Project outside of the Missouri River Basin would accrue within North Dakota. This project is not included in the category of interbasin diversions because it is a portion of the original Pick-Sloan plan.

The water development scenarios also project coal slurry pipelines from Wyoming. The Texas Eastern Pipeline Company proposes to develop 20,000 acre-feet of water per year for use in one of the coal slurry pipelines. Energy Transportation Systems, Inc. proposes to divert up to 50,000 acre-feet of water per year from Lake Oahe into Wyoming for the slurry pipeline transport of coal from Wyoming to the southern United States. Calculating the potential severance taxes that would be paid to Wyoming is a measure of the economic impact of these coal slurry pipelines that would be consistent with this study. However, no calculation of these economic impacts was made since the only sectors in downstream states defined for this study are irrigation, navigation, and main stem hydropower.

Exxon has recently proposed to divert 1.1 million acre-feet per year of water from the Missouri River Basin into Colorado and Utah for oil shale development. This project was included in water development Scenario 4 for identifying its depletive effects. The specific uses of water have not been identified; by study definition, the economic impacts of this diversion were not calculated.

Water development Scenario 4 also includes a diversion of water from the Missouri River for the High Plains Project. This project is identified in a U.S. Department of Commerce investigation on the water resources management of the Ogallala aquifer in Colorado, Nebraska, Kansas, Oklahoma, New Mexico, and Texas. The purposes of the proposed project would be to maintain the 1977 level of irrigation (which would otherwise decrease because of water depletion from the Ogallala Aquifer), and enhance the economy of the region. The proposal contains alternative points of water diversion to the High Plains. The first is above Fort Randall Dam in the upper Missouri River Basin; the second is near St. Joseph, Missouri, on the lower Missouri River. Water development Scenario 4 analyzes the operational impacts of an upstream diversion on the Missouri River system of 2.4 million acre-feet per year diverted by the year 2000, and 4 million acre-feet diverted by the year 2020.

The $6 million U.S. Department of Commerce High Plains study analyzes the economic impacts of: (1) voluntary water conservation, (2) imposed conservation of water withdrawn from the Ogallala aquifer, and (3) importation of water under conditions (1) and (2). The study uses economic input-output models to calculate the total effects of the High Plains Project on the important economic sectors of the region. However, the results are not comparable with the economic measures used for this report and are, therefore, simplified into the parameter of gross value of crop sales.

The High Plains study shows that by the year 2000, water imported to the High Plains region would restore 2,410,000 acres of land to full production. By the year 2020, importation of 4 million acre-feet per year would restore a total of 4,160,000 acres of irrigation. Since these acreages would be in several states, it was decided to use a value of $317 per acre for the gross value of crop sales. This value is very nearly the average for Colorado and Kansas, and is the value for Nebraska.

The resulting economic impact of the High Plains Project on the region's agricultural economy would be $764 million in the year 2000, and $1,318.7 billion in the year 2020. Since these are irrigation values, they could be added to the previously identified economic impacts of projected irrigation, as appropriate, in evaluating the impacts of the High Plains Project.

Although the value of agricultural production is one measure of the economic impact of the project (and the one used in this report), there are considerable secondary benefits. The High Plains study indicates that without the importation of water there will be a decline in the total economy as well as the agricultural sector of the High Plains region. One important economic measure would be the total value that the project would add to all sectors. The total value added by the High Plains diversion project has been estimated at $1,997 million if the project is implemented in conjuction with voluntary water use controls. If mandatory water use controls are used before the High Plains Project is implemented, then the total value added by the High Plains Project would be $220 million per year. The current total value of an acre-foot of irrigation water was estimated to be between $250 and $300 per acre-foot.

The Corps of Engineers has estimated that the cost of diverting approximately 4 million acre-feet per year for the High Plains Project would range from about $11.2 to $17.5 billion, depending on the length of the construction period. Because of the extremely high cost, implementation of the proposal will be very unlikely without substantial federal subsidy. Annual water costs translate to more than $500 per acre-foot diverted.

ECONOMIC IMPACTS OF IMPLIED WATER ALLOCATIONS

The economic parameters have been identified for those sectors which Montana considers important in the scope of this study. These parameters were arrayed according to the future water development scenarios. Tables IV-10 and IV-11 show the economic impacts of various water allocations

TABLE IV- 10 ECONOMIC IMPACT OF VARIOUS WATER ALLOCATIONS IMPLIED BY WATER DEVELOPMENT SCENARIOS

Scenario	Year 2000 Economic Impacts, Million $ Per Year: Montana — Function (A)Irrigation (B)Energy/Coal	Montana — Change Resulting From Implied Water Allocation	Rest of Basin — Function (1)Irrigation (2)Navigation (3)Hydropower (4)High Plains Diversion	Rest of Basin — Change Resulting From Implied Water Allocation
3A	(A) 100.6	0	(1) 1,525.1	0
	(B) 746.0	0	(2) 24.1[1]	0
			(3) 209.8	0
2B	(A) 31.9	- 68.7	(1) 1,454.5	- 70.6
	(B) 269.9	- 476.1	(2) 24.1	0
			(3) 230.5	+ 20.7
3B	(A) 31.9	- 68.7	(1) 850.6	- 674.5
	(B) 269.9	- 476.1	(2) 24.1	0
			(3) 234.1	+ 24.3
2A	(A) 100.6	0	(1) 916.2	- 608.9
	(B) 746.0	0	(2) 24.1[1]	0
			(3) 214.2	+ 4.4
1B	(A) 65.4	- 35.2	(1) 1,087.7	- 437.4
	(B) 512.7	- 233.3	(2) 24.1[1]	0
			(3) 222.8	+ 13.0
			(4) 0	0
4	(A) 65.4	- 35.2	(1) 1,087.7	- 437.4
	(B) 512.7	- 233.3	(2) 24.1[1]	0
			(3) 222.8	+ 13.0
			(4) 764.0	+ 764.0
4 Compared With 1B	(A)	0	(1)	0
	(B)	0	(2)	0
			(3)	0
			(4)	+ 764.0

[1]The navigation economic benefits shown are for average conditions of river flows. If a drought such as 1934-1942 occurs, no navigation service could be provided in 2 to 4 consecutive years (see Table III-20).

TABLE IV- 11 ECONOMIC IMPACT OF VARIOUS WATER ALLOCATIONS IMPLIED BY WATER DEVELOPMENT SCENARIOS

Scenario	Year 2020 Economic Impacts, Million $ Per Year — Montana		Rest of Basin	
	Function (A) Irrigation (B) Energy/Coal	Change Resulting From Implied Water Allocation	Function (1) Irrigation (2) Navigation (3) Hydropower (4) High Plains Diversion	Change Resulting From Implied Water Allocation
3A	(A) 121.9	0	(1) 2,177.5	0
	(B) 1,201.8	0	(2) 19.8[1]	0
			(3) 194.4	0
2B	(A) 57.1	- 64.8	(1) 2,118.7	- 58.8
	(B) 512.7	- 689.1	(2) 24.7[1]	+ 4.9
			(3) 216.0	+ 21.6
3B	(A) 57.1	- 64.8	(1) 1,190.8	- 986.7
	(B) 512.7	- 689.1	(2) 24.7[1]	+ 4.9
			(3) 223.6	+ 29.2
2A	(A) 121.9	0	(1) 1,244.6	- 932.9
	(B) 1,201.8	0	(2) 22.2[1]	+ 2.4
			(3) 199.2	+ 4.8
1B	(A) 94.1	- 27.8	(1) 1,631.0	- 546.5
	(B) 746.0	- 455.8	(2) 24.7[1]	+ 4.9
			(3) 208.7	+ 14.3
			(4)	
4	(A) 94.1	- 27.8	(1) 1,631.0	- 546.5
	(B) 746.0	- 455.8	(2) 0	- 19.8
			(3) 184.5	- 9.9
			(4) 1,318.7	+ 1,318.7
4 Compared With 1B	(A)	0	(1)	0
	(B)	0	(2)	0
			(3)	- 23.3
			(4)	+ 1,318.7

[1] The navigation economic benefits shown are for average conditions of river flows. If a drought such as 1934-1942 occurs, no navigation service could be provided in 2 to 8 consecutive years (see Table III-21).

implied by the water development scenarios for the years 2000 and 2020. Comparisons can be made of the relative economic impacts of future water development decisions. Such decisions might include water allocations resulting from upstream-downstream water conflict. Caution should be used in treating the values derived for the parameters of the various economic sectors as being absolute measures of economic benefits. Each parameter is an individual measure of the direct, or first level, economic return for the selected water using sector, and serves as the basis for the qualitative conclusions of this chapter.

Implied Water Allocations

The water development scenarios are arrays of future water development projections designed to test the hydrologic and resulting economic outputs of the Missouri River Basin system, and to indicate possible water allocations. In order to analyze the implications of water allocations, it was assumed that the O'Mahoney-Milliken Amendment can be taken literally. Therefore, Scenario 3A would mean water development for consumptive uses without regard to nondepletive or instream use. Scenario 3A includes a high projection of future upstream and downstream water depletion, and is the implied future condition under the present institutional arrangements for water allocation. In Tables IV-10 and IV-11 the economic impact of Scenario 3A, listed first, serves as a basis for comparing the relative impacts of alternative water allocations. Comparison of the economic parameters of Scenarios 2B, 3B, and 2A with water development Scenario 3A shows the change in each sector of economic production under each of the implied water allocations compared to unrestricted development.

Scenario 2B implies that upstream water depletion (particularly in Montana) would be developed at a slower rate or under a lower allocation of water. Downstream water development would continue at its unrestricted high rate. Scenario 2B implies that a lower allocation of water for uses upstream of Garrison Dam might be made to preserve or enhance the downstream navigation and hydroelectric power benefits.

Water development Scenario 3B implies that water development would also be restricted in the downstream states (or a lower allocation would be made) to further enhance the downstream benefits of navigation and hydroelectric power production. Water development levels in Scenario 3B imply a low allocation of water or low rate of development of water upstream-downstream.

Water development Scenario 2A includes a high development projection for upstream water development and a low projection of downstream development. This scenario implies that a high water allocation might be made

for the upstream area above Garrison Dam and that the downstream water allocation (or rate of development) would be lowered to enhance navigation and hydropower.

A test of the economic impacts of the High Plains diversion is included with Scenarios 1B and 4. Both scenarios are based on the medium projection of future water development, except that Scenario 4 includes the interbasin diversions previously described. Tables IV-10 and IV-11 show the economic impacts of Scenarios 1B and 4 compared with Scenario 3A. This comparison gives a measurement of economic impacts of the implied water allocations. A comparison of the economic impacts of Scenario 4 with those of Scenario 1A shows the further impact of the water allocation for the High Plains diversion.

Economics of Selected Scenarios

Low Upstream Water Allocation(2B). The comparison of Scenario 2B with Scenario 3A shows the negative economic impacts of a low allocation of water to Montana and provides an indication of the economic impacts on the rest of the basin's irrigation, navigation, and hydropower production. A low upstream water allocation would result in a reduction in Montana gross crop sales for the year 2000 of $68.7 million per year (see Table IV-10) and a negative impact on energy/coal generated state and local taxes of $476.1 million per year. By the year 2020 (see Table IV-11), the benefits from irrigation would be reduced by $64.8 million per year and energy/coal by $689.1 million per year. These are reductions from the economic levels that would be attained under Scenario 3A.

In the rest of the basin, a low water allocation for the area above Garrison Dam would decrease irrigation benefits but enhance navigation and hydroelectric power production. In the year 2000, the gross crop sales for the rest of the Missouri River Basin would be reduced by $70.6 million per year. Navigation benefits would not be affected, and hydropower production would be increased by $20.7 million per year. By the year 2000 the impact on irrigated agriculture in the rest of the basin would be a decline in benefits of $58.8 million per year. Navigation would be enhanced by $4.9 million per year and there would be $21.6 million per year of increased hydroelectric power production.

Low Upstream, Low Downstream Water Allocation (3B). This scenario measures the impacts of a low water allocation within the entire basin to maintain the navigation and hydropower benefits. The economic impacts to Montana resulting from a lower water allocation have been described above. The low allocation of water to the rest of the basin would have the following effects: irrigation benefits would be reduced by $674.5

million annually by year 2000 and $986.7 million by year 2020; navigation benefits would not be affected by the year 2000, but by the year 2020, there would be an annual increase in benefits of $4.9 million; and annual hydropower production benefits would increase by $24.3 million in the year 2000 and $29.2 million in year 2020.

High Upstream Allocation, Low Downstream Water Allocation (2A). This comparison shows the economic impacts of reduced water allocation downstream of Garrison Dam to enhance navigation and hydropower benefits. A high upstream water allocation would result in no decline in irrigation or energy/coal benefits to Montana for either year 2000 or 2020. The downstream economic impacts include: decreases in irrigation benefits of $608.9 million per year by 2000 and $932.9 million per year by 2020. There would be no change in navigation benefits for year 2000 and an increase of $2.4 million per year for the year 2020. Hydroelectric power, would realize increases in the value of production amounting to $4.4 million per year for the year 2000 and $4.8 million per year for the year 2020.

Medium Water Allocation (1B). If a water allocation were based on the medium projection level of future water development, the economic impacts would be measured by comparing Scenario 1B with Scenario 3A, (see Tables IV-10 and IV-11). The impacts to Montana include: decreases in irrigation benefits of $35.2 million per year by year 2000, and $27.8 million per year by year 2020. Energy/coal benefits would decrease by $233.3 million per year in the year 2000, and $455.8 million per year by year 2020. The impacts on the rest of the basin include: irrigation decreases of $437.4 million per year by 2000, and $546.5 million per year by year 2020; navigation would experience no change in benefits by year 2000, and an increase in benefits of $4.9 million per year by the year 2020; and hydroelectric power production would realize increases in the value of production amounting to $13 million per year by 2000 and $14.3 million per year by the year 2020.

Interbasin Diversion. The High Plains Project would result in positive irrigation benefits at the expense of navigation and hydroelectric power production. Other economic impacts could be positive or negative, depending upon total water allocations. If the diversion reduced other water allocations, including Montana's, there would be a negative impact. That possibility is not specifically demonstrated by the scenarios chosen because the effects on Montana of a medium level water allocation in Scenario 1B are the same as shown for Scenario 4, which includes the transbasin diversions. This would seem to imply that Montana would not suffer a negative economic impact from a transbasin diversion. However, if total levels of water allocation for the upper basin are reduced spe-

cifically for interbasin diversion, then Montana would be negatively impacted.

The economic impacts to the rest of the basin include: irrigation would realize increases in benefits of $764 million per year by the year 2000 and $1,318.7 million per year by 2020 (this includes benefits to Colorado, Kansas, and Nebraska in the Missouri River Basin and benefits to Oklahoma, New Mexico, and Texas outside of the Missouri River Basin); navigation benefits, decreases of $2.6 million per year by the year 2000 and $19.9 million per year by 2020 (total loss of navigation by that time); and hydroelectric power, an increase in the value of production of $13 million per year by year 2000 and a decrease of hydropower production value of $23.3 million per year by 2020.

Summary and Conclusions

Previous sections show the economic impact of implied alternative water allocations in terms of dollar values. In summary, however, the following qualitative statements appear appropriate.

1. Navigation benefits will continue past the year 2000 regardless of upper basin depletion levels, unless a severe drought occurs. Upper basin (above Sioux City) depletion increases of 1.6 to 1.7 million acre-feet per year over 1975 levels, coupled with a drought like that of the 1934-1942 period, are the threshold beyond which navigation may not be economically viable (see Chapter III conclusions).

2. A reduced water allocation to Montana can result in enhanced hydropower production from the six main stem Missouri River power plants in both year 2000 and 2020. The enhancement to navigation would not accrue until near the year 2020.

3. A lower upstream water allocation (above Garrison Dam) would also reduce irrigation benefits in the rest of the upstream area above Garrison Dam.

4. The economic values of the enhanced hydropower production are very small compared with the state and local taxes generated by the energy/coal sector in Montana, and are less than the economic benefits of Montana irrigation in terms of gross crop sales.

5. If total basin water allocation is reduced to maintain navigation and hydropower, the decrease in agricultural benefits is

far greater than the benefits of maintaining navigation and enhancing hydroelectric power.

6. If the interbasin diversion to the High Plains is undertaken as an addition to water allocated for Missouri River Basin water uses, the large benefits to the region would appear to offset the loss in benefits from navigation and hydroelectric power production.

7. There are tradeoffs that may not be apparent in the direct comparisons given in Tables IV-10 and IV-11. For example, the benefits to Montana accrue to some extent at the expense of the current out-of-state users of navigation and hydropower. As an example, the production of energy in Montana will offset the energy lost through the reduction in hydroelectric power. It is noted, however, that the Pick-Sloan Missouri River Basin project planners contemplated that such reductions would take place in the future as water projects were developed.

8. No attempt has been made to judge what is the "most probable" level of development within any segment of the Missouri River Basin. On the basis of recent trends and current institutional implications, it would appear that a low to medium level of development might be an appropriate "most probable projection" for the upper basin, and a medium to high level of development might be an appropriate "most probable projection" for the lower basin. Another reason for this conclusion is the relative constraint to water development in the upper versus the lower basin. In the upper basin, water projects face public land and environmental issues, and many projects require federal input and subsidy. In the lower basin, private lands are involved for the most part, and the environmental issues may not be as great as in the upper basin. It therefore appears that there are fewer constraints to water development in the lower basin.

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CHAPTER V

Legal Aspects Of Interstate Water Allocation

CHAPTER V -- LEGAL ASPECTS OF INTERSTATE WATER ALLOCATION

INTRODUCTION -- OVERVIEW

Many rivers in the eastern states form boundaries between states or provide important waterways for commerce among them. No important disputes over interstate streams arose until the present century, when irrigation developments in the western states began to seriously deplete large streams that flowed between them. Three methods of handling the resulting disputes have evolved. The first was the interstate lawsuit resulting in an "equitable apportionment" between the states, the second was the interstate compact negotiated to allocate the waters, and the last was a "congressional apportionment" made in the exercise of federal powers over navigable waters and federal property.

The doctrine of equitable apportionment had its start in 1902 when Kansas filed suit against Colorado over the Arkansas River, which rises in Colorado, is heavily used there for irrigation, and then flows through Kansas. (Kansas v. Colorado, 185 U.S. 125, 1902.) In 1907 the Supreme Court of the United States decided the case, stating the first principles governing the states' relationships regarding waters shared between them: "One cardinal rule, underlying all the relations of the states to each other, is that of equality of right. Each state stands on the same level with all the rest." (Kansas v. Colorado, 206 U.S. 46, 1907.) Kansas had urged that by the common law of riparian rights, she and her citizens were entitled to the natural flow of the river, undiminished, while Colorado claimed for her citizens the right as prior appropriators to dry up the entire stream. Neither could be the rule, said the Court; neither state could force her law upon the other. "This Court is called upon to settle that dispute in such a way as will recognize the equal right of both and at the same time establish justice between them." The Court said that each was entitled to "an equitable division of benefits . . . (an) equitable apportionment of benefits between the two states resulting from the flow of the river." It is important to note at this point that this did not call for a literal division of the water of the river, but of the benefits from the flow of the river.

In two later suits, however, the waters themselves were divided. Wyoming v. Colorado (259 U.S. 419, 1922) resulted in a split of the Laramie River, 39,750 acre-feet to Colorado and the balance to Wyoming, each state's share to be divided among its citizens according to its own laws. Nebraska v. Wyoming (325 U.S. 589, 1945) involved the North Platte River which rises in Colorado, is substantially augmented in Wyoming, and flows into Nebraska. The division was accomplished by a more complex formula of restrictions on irrigated acreages, specific orders for operation of projects, and a percentage division of a portion of the flow. In both these cases each state used the law of prior appropriation to govern the rights of water users with the state, and prior appropriation was used by the Supreme Court as the guiding principle for making the equitable apportionment among the claimant states.

In an eastern controversy, more flexible controls were employed, although riparian law was not literally applied. In New Jersey v. New York (283 U.S. 336, 1931), New Jersey objected to a large diversion from the Delaware River to New York City, on grounds that today would be called environmental damage and injuries to instream uses. The decree limited the diversion from the basin to an amount that would not substantially injure the oyster fisheries in Delaware Bay and required New York municipalities on the river to treat sewage discharges and maintain minimum flows by releases from storage. This was not meant to be a "prior appropriation," however, said the Court, the door was left open to future adjustments. These are the principal cases that established the doctrine, but in several other suits relief was denied.

In the early 1920s the complexities, uncertainties, and other disadvantages of the interstate lawsuit led the states of the Colorado River Basin to attempt to settle their differences by agreement. They were unable to agree as to the share of each state, but they did agree to allocate approximately half of the water thought to be available to the states in the intermountain region of the upper basin, and the other half to the states of the lower basin in the southwestern desert. This incomplete compact served as the model or inspiration for many more, but most modern compacts settle the share of each state to the river. The example closest to home is the division of the tributaries of the Yellowstone River between Wyoming and Montana into fixed percentages of the water remaining available for appropriation. The Supreme Court has said that such a division is as much an equitable apportionment as a decree of the Court would have been. (Hinderlider v. LaPlata River & Cherry Creek Ditch Co., 304 U.S. 92, 1938). Some compacts set up commissions to administer the details of these divisions, and these have evolved into a "third level of government" in some areas -- the federal-interstate compacts on the Delaware and Susquehanna Rivers in which the federal government is an active party, not merely a consenting supervisor, and the commission is an important planning, approving, constructing, and operating body.

There has been only one example of congressional apportionment. The Boulder Canyon Project Act of 1928 conditioned the construction of Hoover Dam on California's agreement to limit its claim to Colorado River water to a specific amount and authorized the Secretary of the Interior to split the available balance between Arizona and Nevada by contracts to deliver water from the reservoir. This directive left no room for a decree of equitable apportionment that might make a different division, said the Supreme Court in Arizona v. California (373 U.S. 546, 1963).

The Missouri River straddles the 98th meridian, the line between east and west, between the humid and arid zones. In the west the present use and future need is to take the water from the river for use on farms, in cities, in industries, and for development of energy. In the east, the

primary use of the water is within its banks, to transport freight with barge and tugboat. In the Flood Control Act of 1944 Congress authorized the "Pick-Sloan Plan," the Sloan Plan to provide irrigation, municipal, and industrial water in the upper basin, the Pick Plan for flood control, hydroelectric power, and navigation downstream. The possibility of conflict was foreseen. The O'Mahoney-Millikin Amendment to the Act provides that the use of waters arising west of the 98th meridian for navigation shall not conflict with their beneficial consumptive use for domestic, municipal, stock water, irrigation, mining, or industrial purposes.

Today, with the Pick Plan practically complete but with only 40% of the western projects built, that conflict looms large. All the scenarios for the future of the basin (except one of virtual stagnation) show that if development proceeds in predictable fashion, with no further legal constraints, depletion in the upper basin will, within the next 20 or 40 years, bring navigation to a halt. "Allocation of the Missouri River among the states of the basin" really comes down to this: will a lid be placed on development in the states of the upper basin, so the "allocation" becomes little more than maintenance of the status quo? Or will it be recognized that preserving the benefits of navigation means the loss of much greater benefits of upstream irrigation and energy development? In a very real sense, the conflict is one between the past and the future.

The decision may be made by the Supreme Court of the United States, by Congress, or by the states of the basin acting in concert. The Court might decide that the balance of benefits favors upstream development. It might rule that Congress has already decided the conflict by the O'Mahoney-Millikin Amendment, although this is by no means certain. The states may find trade-offs that could lead to an amicable settlement by compact. No matter who is the decision-maker, the notion of "equitable apportionment of the benefits resulting from the flow of the river" will form the basis for decision.

EQUITABLE APPORTIONMENT

Basic Principles

The Supreme Court has never given a definition of an equitable apportionment, and it is very difficult to construct one from the few cases on the subject. The very notion of equity is that it is a response to an individual situation, not the application of a fixed rule.

Mr. Justice Holmes came the closest to giving a helpful description in the Delaware River case (New Jersey v. New York, 238 U.S. 336, 1931):

> A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it. New York has the physical power to cut off

> all the water within its jurisdiction. But clearly the exercise of such a power to the destruction of the interests of lower States could not be tolerated. And on the other hand equally little could New Jersey be permitted to require New York to give up its power altogether in order that the river might come down to it undiminished. Both States have real and substantial interests in the River that must be reconciled as best they may be. The different traditions and practices in different parts of the country may lead to varying results but the effort always is to secure an equitable apportionment without quibbling over formulas.

It is clear that equitable apportionment is more than a mere split of the water into shares for each state. "Benefits resulting from the flow of the river" can be of many kinds. Some benefits may be divided among several states, some accrue only to one. "Apportionment" may mean assigning one benefit to one state and denying it or some other benefit to another. Divisible benefits include water, electric power (Colorado River Storage Act, 43 USCA Sec. 620), and fish (Idaho seeks an apportionment of Columbia River salmon, Idaho v. Oregon and Washington, 100 S.Ct. 616, 1980). Instream benefits such as estuarine oyster fisheries, anadromous fish runs, navigation, and recreation are tied to particular places.

The basic conditions of time and place will shape the apportionment. The case may arise in the humid zone between eastern states, or between arid and semi-arid states on the western plains, mountain valleys, and deserts. A satisfactory apportionment for the present may need to be modified as conditions change (New Jersey v. New York, 283 U.S. 336, 1931; 345 U.S. 369, 1953). The problem changes from case to case: how to protect existing uses (Wyoming v. Colorado 259 U.S. 419, 1922), how to operate an overappropriated river (Nebraska v. Wyoming, 325 U.S. 589, 1945), or how to divide unappropriated waters among future users (Arizona v. California 373 U.S. 546, 1963). The cases have involved both protections for and restrictions on different uses: large interbasin municipal diversions, in-basin and out-of-basin irrigation projects, power production, navigation, oyster fisheries, fish runs, and water recreation.

Numerous and diverse factors have influenced the Court. "Headwater rights," the claim that those in the area which produces the water should have a special right to it, have been recognized to some degree. The upper state may not keep all of it (Kansas v. Colorado, New Jersey v. New York), but the presence of abundant water was a factor in allocating water to the intermountain valleys in which the North Platte rises (Nebraska v. Wyoming, 325 U.S. 589, 1945). The availability of water from other sources is a consideration (Connecticut v. Massachusetts, 282 U.S. 660, 1931). The value of the product of the water is important, as is the greater need of one state to rely on irrigation for agricultural production (Kansas

v. Colorado). Speculative losses of the benefits of projects that may never be built have been ignored (Colorado v. Kansas, 320 U.S. 383, 1943; New Jersey v. New York; Connecticut v. Massachusetts).

Two major factors conflict with each other; sometimes one is paramount, sometimes the other. Protection of vested rights plays an important part, but balance of benefits has an appeal to equity. When the states apply the rule of priority in allocating water intrastate to its inhabitants, the application of prior appropriation between the states is equitable (Wyoming v. Colorado). It is not the only rule, however; even between priority states protection has been given to an established economy based on junior rights (Nebraska v. Wyoming).

When the Court applies the test of balance of benefits, it is no more consistent. In Kansas v. Colorado the Court noted that the prosperity of the Colorado counties through which the Arkansas River flows was largely due to irrigation, and said,

> This effective cause of Colorado's development should not be destroyed without corresponding benefit . . . . There has been some detriment to the southwestern portion of Kansas, and yet, when we compare this detriment with the great benefit which has obviously resulted in Colorado, it would seem that equality of right and equity between the two states forbids any interference with the present withdrawal of water in Colorado for purposes of irrigation.

Yet when the second case, Wyoming v. Colorado, came before the Court 15 years later, the Court rejected Colorado's argument that she could accomplish more with the water to produce crops on the fertile plains than Wyoming did in the high Laramie Valley to produce winter feed for livestock.

When the Court does balance the benefits, a detriment in one state has been weighed against the benefit in another. (Kansas v. Colorado.) The Court has also approved a project in which Congress, seeking the overall national interest, placed all of the losses of flooded land and taxable revenues in one state and all the benefits of flood control and navigation in another. (Oklahoma v. Guy F. Atkinson Co., 313 U.S. 508, 1941.)

A suit for the equitable apportionment of the Missouri River, brought by downstream states against Montana and the other upstream states, will not fit within the pattern of the previous western cases. In the two principal cases, involving the apportionment of the Laramie and North Platte Rivers, each river had been overappropriated, demands had been made on the flow that exceeded the supply, and the apportionment, when all the authorized withdrawals were made as allowed in the decree, was expected to

exhaust the supply and dry up the river. The conflict in a Missouri River case is not likely to arise in this fashion. Despite all the trends toward increased in-basin use and the projections of out-of-basin diversions made in Chapter II of this report, none of the scenarios developed in Chapter III disclose a situation in which Montana's depletions would either deprive existing downstream projects of water for consumptive use or leave insufficient water for projected downstream diversions from the river. The conflict on the Missouri will pit upstream depletive uses or diversions against downstream nonconsumptive and instream uses. The case will be more like the eastern case in which navigation on the Great Lakes was impaired by large diversions from Lake Michigan to the Mississippi River through the Chicago Sanitary Canal (Wisconsin v. Illinois, 278 U.S. 367, 1929).

Nevertheless, because responsibility for the Missouri diversions will be so diverse and shared by a number of states, any limits that may be placed on upstream diversions or depletions are likely to be divided between the upstream states. The result may look very much like an apportionment to them of shares of the river, similar to the Laramie and North Platte cases. This could occur if upstream depletions exceeded low levels and started toward a medium level that threatened navigation. If the lower states sued and won a judgment that cut back depletions to low levels, a second phase of that suit (or a second suit) would be needed to decide how much of the cutback of current uses each state should bear. If the lower basin states lost the suit on the navigation ground, they might shift their complaint to an environmental basis. If the court then held the upper basin to medium depletions that would probably stop navigation but would minimize harm to environmental and recreational values, the second phase would be needed to divide the allowable increase in depletions by apportioning future uses of unappropriated water among the upper basin states.

Montana would be a prime target in such a suit. She contributes 62% of the inflow to Garrison Reservoir and 48% of the flow at the head of navigation at Sioux City, Iowa. Large depletions within Montana that caused serious harm to downstream states through a reduction of these contributions would be very likely to bring the lower basin states out fighting. The analyses in Chapters III and IV show distinct possibilities that such harms will occur by the year 2000 under several of the projected scenarios, and the practical certainty that they will come by 2020.

In the following sections a number of issues that might arise in a case of this nature are discussed. In several instances the arguments on both sides are displayed without indicating which will probably prevail. An overall evaluation of the possible and probable outcomes of such a suit will await discussion of all issues. While it is probable that the O'Mahoney-Millikin Amendment to the Flood Control Act of 1944 will determine the ultimate outcome of the suit, some argument to the contrary is possible. The Amendment will be analyzed separately in a later section dealing with congressional apportionment.

Grounds for Suit

It is very difficult to state a rule as to what constitutes a "cause of action" for an equitable apportionment. The first case, Kansas v. Colorado, though full of sweeping generalities, is remarkably hazy about the actual grounds of decision. Only a few words toward the close of the opinion indicate the law the Court was applying. After contrasting the development of Colorado with irrigation and of Kansas without it, the Court said,

> Summing up our conclusions, we are of the opinion that . . . the appropriation of the waters of the Arkansas by Colorado, for purposes of irrigation, has diminished the flow of water into the state of Kansas; that the result of that appropriation has been the reclamation of large areas in Colorado, transforming thousands of acres into fertile fields, and rendering possible their occupation and cultivation when otherwise they would have continued barren and unoccupied; that while the influence of such diminution has been of perceptible injury to portions of the Arkansas valley in Kansas, particularly those portions closest to the Colorado line, yet, to the great body of the valley it has worked little, if any, detriment, and regarding the interests of both states, and the right of each to receive benefit through irrigation and in any other manner from the waters of this stream, we are not satisfied that Kansas has made out a case entitling it to a decree. At the same time it is obvious that if the depletion of the waters of the river by Colorado continues to increase there will come a time when Kansas may justly say that there is no longer an equitable division of benefits, and may rightfully call for relief against the action of Colorado, its corporations and citizens, in appropriating the waters of the Arkansas for irrigation purposes.
>
> The decree which, therefore, will be entered, will be one dismissing . . . the bill of the state of Kansas as against all the defendants, without prejudice to the right of the plaintiff to institute new proceedings whenever it shall appear that, through a material increase in the depletion of the waters of the Arkansas by Colorado, its corporations or citizens, the substantial interests of Kansas are being injured to the extent of destroying the equitable apportionment of benefits between the two states resulting from the flow of the river.

From this one gathers that the Court, in order to issue a decree, would have required either a substantial injury or detriment to existing uses, or a destruction of the equitable apportionment of benefits. Are these the same? Must the loss of benefits that would deprive a state of

her share be an injury to present uses or may it include the loss of opportunities to use? The Court has never clearly made the choice, and this ambiguity still raises many problems. The tension between the requirement of harm and the need to allocate shares creates basic uncertainties. Rules for one type of relief may not be suitable for the other, and a particular case may require a choice between them.

Harm or Threat of Harm

In both of the cases in which the Court has actually granted an equitable apportionment and divided a river among claimant states, the suit has been brought as a response to a new project in the upstream state that threatens to deprive prior appropriators in the downstream state of the water to which their priority entitles them. In Wyoming v. Colorado (259 U.S. 419, 1922) an irrigation district on the eastern Colorado plains acquired the incipient water rights of a project that called for a tunnel to take the headwaters of the Laramie River in Colorado to the more fertile plains. Financing was obtained and actual work was begun when Wyoming brought the suit. The water needed to satisfy prior rights in both states was subtracted from the dependable supply, as found by the Court, and the decree was in the form of an injunction against taking through the tunnel more than the water found to be unappropriated. Yet as administered, the decree was treated as dividing the river, a share to Colorado for the tunnel and all senior Colorado users, and a share to Wyoming for all the users in that state. Much later (353 U.S. 953, 1957) an amended decree restated the decree as an allocation of so many acre-feet to each state.

In Nebraska v. Wyoming (325 U.S. 589, 1945), the suit was specifically one for the determination of the equitable share of each state in the water of the North Platte River, and it involved numerous alleged out-of-priority diversions by Wyoming and Colorado irrigators. Nevertheless, the Kendrick Project in Wyoming was the main target of the plaintiff. Started in 1931, completed during the drought, and not yet put in operation when the suit was begun, the Kendrick Project called for Seminoe Reservoir with a capacity of over 1,000,000 acre-feet and the irrigation of 66,000 acres.

> The Kendrick Project plainly is an existing threat to senior appropriators downstream. As we have noted, it is junior to practically every appropriation on the river . . . and in view of the general position taken by Wyoming with respect to Nebraska priorities, it cannot be assumed that the Kendrick Project would be regulated for the benefit of senior appropriations in Nebraska.

The decree of the Court specifically required the State of Wyoming, in regulating storage in Seminoe Reservoir, to recognize senior priorities in Nebraska.

All this is not to say that allocating the water was not treated as an important aspect of these cases. It was, of course, and these cases will be considered further in discussing the need for apportionment as well as for protection.

The case between eastern states, New Jersey v. New York (383 U.S. 336, 1931) was similarly an action to enjoin the threat of a large trans-divide diversion of the Delaware River into the Hudson drainage to supply New York City. In that case, the decree was solely one for protection; it limited the diversion to the amount that would minimize the harm in the Delaware basin, and made no form of allocation to other states or other users. Even the amount fixed was made subject to change. For these reasons, some authorities maintain that this case did not really make an equitable apportionment.

There have been a number of cases brought for an equitable apportionment in which relief has been denied on the ground that the upstream state was inflicting no harm or threat of harm upon the downstream neighbor. These are analyzed in the next subsections.

The Problem of Speculative Harm

In one group of cases there was doubt that the harm would ever come about. The first of these was New York v. Illinois (274 U.S. 488, 1927), not an equitable apportionment case, but one phase of the Great Lakes drainage litigation. An injunction was sought by New York to enjoin the continuation of diversions of Lake Michigan water through the Chicago Sanitary Canal down the Mississippi to carry away Chicago's sewage. Primary reliance was placed on alleged injuries to navigation, but it was also urged that the diversion might interfere with or prevent the use of the Niagara and St. Lawrence Rivers for the development of power. This phase of the case was held to present no ground for relief:

> But (New York) does not show that there is any present use of the waters for such purposes which is being or will be disturbed; nor that there is any definite project for so using them which is being or will be affected. The waters are international and their use for developing power may require the assent of the Dominion of Canada and the United States. No consent of either is shown. The suit is one for an injunction, a form of relief which must rest on an actual or presently threatened interference with the rights of another. Plainly, no basis for such relief is disclosed in what is said about water power development. At best, the (claim) does no more than present abstract questions respecting the right of the plaintiff state and her citizens to use the waters for such purposes in the indefinite future. We are not at liberty to consider abstract questions.

The next case was New Jersey v. New York, (283 U.S. 336, 1931), the "eastern equitable apportionment case." New York was restrained from taking more than a specified amount of water from the Delaware River out of the basin for use in New York City, the amount being calculated as the maximum that could be diverted without causing substantial harm to recreational uses of the river or to the oyster fisheries in Delaware Bay. One complaint of New Jersey was that the flow of the river would be reduced to the injury of future power projects in that state. With regard to this allegation, the master appointed by the Supreme Court concluded that any future plan of New Jersey for constructing power dams would need the consent of Congress and the states of New York and Pennsylvania, and although these projects were possible as a matter of engineering, they probably would not pay. He added that there was no such showing of a present interest as to entitle New Jersey to relief. This portion of his report was confirmed by the Supreme Court without discussion.

The Failure to Prove Harm

In another group of cases, relief was denied to a plaintiff state that alleged harm but failed to prove it. In Colorado v. Kansas (320 U.S. 383, 1943), Colorado sued to enjoin Kansas and some of her water users from harassing Colorado appropriators in violation of the judgment in the first equitable apportionment case, Kansas v. Colorado, and Kansas counterclaimed for an equitable apportionment. This phase of the case was dismissed, on the ground that although Kansas showed that Colorado's uses had increased, the increase had not worked a serious detriment to the substantial interests of Kansas. Kansas claimed that 414,000 acres could have been irrigated had not Colorado deprived Kansas of her equitable share of the river's flow. The Court said, "We are asked to speculate as to how much of this land would have been put under irrigation under more favorable circumstances."

This doctrine next appeared in a strongly-worded dissent in the North Platte case, Nebraska v. Wyoming (325 U.S. 589, 1945). The apportionment there was made by a five to three majority of the Court. The dissent strenuously objected:

> Without proof of actual damage in the past, or of any threat of substantial damage in the future, this Court now undertakes to assume jurisdiction over three quasi-sovereign states to supervise for all time their respective uses in an interstate stream . . . No injury results from a deprivation of water unless a need is shown for that water for beneficial consumptive use at that time . . . . No state can play dog in the manger and build up reserves for future use in the absence of present need and present damage . . . . In such cases, the complaining state must show actual or threatened damage of substantial magnitude to move this Court to grant relief . . .

Washington v. Oregon (297 U.S. 517, 1936) also falls within this category. An equitable apportionment was sought of the Walla Walla River, a nonnavigable tributary of the Columbia which rises in Oregon and flows into Washington. There was much conflicting evidence in the case -- many questions that the master resolved in favor of defendant Oregon. The final question turned on the priority of a single Washington claimant, Gardena Farms, to the waters of two tributaries, the Tum-a-lum and the Little Walla Walla. The master found the claim had been abandoned and Washington contested this ruling. But even in the absence of abandonment, said the Court, there would not be an inequitable apportionment:

> At present there would be no benefit to Gardena, or none that has been proved, if the waters of the Tum-a-lum were not obstructed by the dam. In all likelihood they would be lost in the deep gravel of the channel and would not reappear beyond until the shortage season had gone by. So also, there would be no benefit, or none that has been proved, if the use of the Little Walla Walla were less than it has been. The chief points of junction with the main river are below the intake of the canal where Gardena is privileged to tap the waters of the stream. No evidence brought to our notice by either of the parties carries with it a suggestion that other Oregon priorities would be cut down or displaced if the Gardena priority were established to the full. We need not go into the question more fully at this time.
>
> The case comes down to this: the court is asked upon uncertain evidence of prior right and still more uncertain evidence of damage to destroy possessory interests enjoyed without challenge for over half a century. In such circumstances an injunction would not issue if the contest were between private parties, at odds about a boundary. Still less will it issue here in a contest between states, a contest to be dealt with in the large and ample way that alone becomes the dignity of the litigants concerned.

The Fact of No Harm

A decree will not be issued to declare that present uses, not injured, not contested, are within the equitable share of the state in which they are located. This was decided in two almost unknown, almost lost, almost forgotten phases of the Colorado River litigation, Arizona v. California, (373 U.S. 546, 1963). That case involved not only the main river but also some tributaries within the lower basin: the Virgin River, Kanab and Johnson Creeks, the Little Colorado River, and the Bill Williams River, all in Nevada, Utah, Arizona and New Mexico. All of these rivers make regularly recurring contributions to the mainstream supply and in the hearings

before the master, California expressed concern that increased use on some of these tributaries would decrease the supply in the mainstream. The master held that neither the 1922 Colorado River Compact nor the Boulder Canyon Project Act dealt with these streams and that the doctrine of equitable apportionment would apply to any division of the waters of the tributary streams between the states in which they arise and the mainstream states. The master held, however, that there was no occasion at that time to apportion these streams between the states. The mainstream users were presently enjoying the use of tributary inflow and there was no indication that such enjoyment was in immediate danger of being interfered with. (Master's Report 315-318, 1960).

The master also dealt with possible controversies between the states in regard to the division of the tributaries between themselves. Arizona and New Mexico share the Little Colorado; Utah, Arizona, and Nevada share the Virgin River; and Utah and Arizona share Kanab and Johnson Creeks. Nevada, New Mexico, and Utah asked for a decree confirming existing uses and reserving water for future requirements. The Master's Report states:

> As stated above, the Supreme Court will not apportion the waters of an interstate stream unless the state seeking an adjudication establishes "by clear and convincing evidence" that there exists substantial conflict over the present use of water . . . . Neither Nevada, New Mexico nor Utah has met this burden . . . . None of the downstream states contests existing upstream uses . . . . Arizona, downstream state on each . . . maintains that existing upstream uses . . . do not interfere with her uses . . . . Thus, Nevada, New Mexico . . . and Utah are, in effect, asking for a declaratory decree confirming their respective existing tributary uses despite the fact that such uses are unchallenged. Such a decree would be wholly without precedent. Indeed, an unbroken line of decision requires that jurisdiction be not exercised. (Master's Report, 323.)

The master's recommended decree treated these cases only in a savings clause: "VIII. This decree shall not affect: . . . (B) the rights or priorities to water in any of the lower basin tributaries of the Colorado River in the states of Arizona, California, Nevada, New Mexico and Utah . . . . " The decree of the Court repeats this language. The opinion of the Supreme Court dismissed all of these cases with the single offhand statement: "We are not required to decide any other disputes between tributary users or between mainstream and tributary users." (373 U.S. 346, 1963.)

Type of Harm

If the Missouri River is thought to present a case calling for the prevention of actual or threatened harm to present users, the first problem

faced by downstream states contemplating such a lawsuit is whether they are threatened with harm of the necessary type and of sufficient magnitude to give them standing to bring a suit. They must, in legal terms, prove a prima facie case, one sufficient to win if no controverting evidence is produced or if no defense based on additional facts is made.

The possible harms to downstream Missouri Basin states fall into three classes: reduction and possible cessation of navigation below Sioux City, reduction of power production from the main stem dams above Sioux City, and losses to recreation and environmental values in the lower reaches of the river.

The most serious threat is that to navigation. It appears almost certain that unless they are checked, sooner or later upstream depletions of Missouri River water will reduce the available flow below the main stem Corps of Engineers dams so that navigation on the Missouri River between Sioux City, Iowa and the mouth will be seriously curtailed or halted.

The scenarios developed in Chapter III show that by the year 2020, projected depletions will seriously impair navigation under every scenario except No. 3B (low level of development both upstream and downstream), and that the danger is closely approached even under 3B. By the year 2000 high upstream depletions will imperil navigation in scenarios 1C and 3A, and even medium upstream depletions raise that threat if the gains occur under 1B conditions. "Serious impairment" translates into two factors: in normal years, a decrease of navigation equivalent to shortening the average season by nine days to one-half month each year, and the probability that in a repetition of the 1934-42 drought (which has a 2 to 3 percent chance of occurring in the next century), navigation could cease entirely for several consecutive years, with the resulting bankruptcy of the barge transportation industry and shutdown of facilities, with a possible permanent loss of all navigation benefits. Only in the scenarios in which upper basin development is held to the lowest level projected will navigation survive a post-2000 drought (Nos. 1A, 3B), and even under those scenarios the supply will probably be insufficient by the year 2020. If the maximum predictions for interbasin diversions are added to medium levels of inbasin depletions (Scenario 4), navigation would be completely suspended during 36 years (15 of them consecutive) in a repetition of the flows recorded for the years 1898-1979. Even in the good years, more than a month of navigation will be lost each year.

A generalized loss of power production will occur throughout the entire basin, in every scenario. In those that will produce severe impairment to navigation, the reductions will range from 1.2 to 1.7 billion kilowatt-hours per year by the year 2000; and by 2020, every year of normal water supply will show a loss from 1975 levels of 1.3 to 3.2 billion kilowatt-hours. In the case of a repetition of the 1934-42 drought period,

the dollar losses of power will be only slightly increased but the loss will represent a much higher percentage of 1975 production.

Environmental losses may accompany the reduction in the benefits of transportation and the production of inexpensive power. The depletion of the mainstream will add to existing degradation of the channel below Sioux City, caused by channelization and bank stabilization, and to other environmental harms already presenting problems in the lower reaches. Channel degradation has some economic accompaniments, such as relocation of intake structures, boat landing facilities, and transportation facilities. Depletions will hasten or increase the purely environmental effects, causing lessened aesthetics, loss of use of the natural river, the loss of oxbows, chutes, and backwaters that form fish and wildlife habitat and offer recreational opportunities.

The economic losses from all of these types of harm are substantial. The economic impact of the navigation losses and reduction of power production are detailed in Chapter V. An example of the type of claim that will be made is found in a study from a lower basin state (Osterberg, The Cost to Iowa of Diverting Water from the Missouri River, Institute of Urban and Regional Research, University of Iowa, Iowa City, Iowa, January 1982). Under one somewhat exaggerated version of Scenario No. 4 (the worst case, including the major interbasin diversions), the claimed harms to the state were summarized as follows:

> The cost to Iowa of losing 8.5 MAF of Missouri River water by the year 2000 is found to be:
>
> (1) the total loss of barge transportation worth $5.1 million per year in 2000;
>
> (2) the loss of hydroelectric power and its replacement by new sources of power at an added cost of $3.9 million per year; and
>
> (3) significant losses to water users, recreation, and wildlife habitat which are difficult to measure but significant.

Burden of Proof

What the downstream states fear most is a multi-year suspension of navigation, such as might happen during a repetition of the 1934-42 drought, which has a 2 to 3% chance of occurring. A lawsuit based on this type of probability evidence would face something of a problem of burden of proof. The Supreme Court has always insisted that before a state of the Union is brought to book before it, there must be "clear and convincing

evidence" of "harm of a serious magnitude." (Washington v. Oregon, 297 U.S. 517, 1936, citing many cases). In that same case, Mr. Justice Cardozo, denying relief to the plaintiff state, summed up as follows: "The case comes down to this: the Court is asked upon uncertain evidence of prior right and still more uncertain evidence of damage to destroy possessory interests enjoyed without challenge for half a century."

Although the 2 to 3% chance during the century can be ridiculed as remote and the danger as miniscule, there is a very good chance that this evidence would be accepted as meeting the test. An event that can be scientifically predicted to this degree and can be shown to be sufficient to destroy a substantial industry and cause permanent loss of its benefits can be said to present a threat of serious magnitude. This is exactly the sort of evidence that Congress continually acts upon in enacting the flood control protection laws. The risk is enormous compared to the risk that a banned drug or food will cause a cancer. Little reliance can be placed on this evidentiary factor as a defense to the suit.

Sufficiency of Harm

Navigation. Assuming that the above harms occur or are threatened, the question remains whether they amount to that type of loss the law requires. If there is no legally enforceable right to receive the benefits, their loss will fall under the Latin principle, damnum absque injuria (loss not amounting to legal harm). Substantial authority can be mustered for the proposition that a state cannot complain of a reduction in the quantity of water artificially released into a river channel to improve the natural navigability.

In the protracted litigation known as the Great Lakes cases, the Supreme Court dealt with a series of controversies between Illinois and the "downstream states" on the Great Lakes. The conflicts involved the loss of navigation due to a lowered level in the lakes. This occurred when the Sanitary District of Chicago dug a great canal to the Mississippi River, reversed the flow of the Chicago River, sent Chicago's sewage down river in large quantities of Lake Michigan water, and incidentally opened a navigable waterway between the Great Lakes and the Gulf of Mexico. The first withdrawals were made pursuant to an order of the Secretary of War under an act of Congress. When he issued a new order for a reduction in the amount of diversion, the Sanitary District refused to comply. The first case in the litigation, Sanitary District of Chicago v. U.S. (266 U.S. 405, 1925), was not an interstate lawsuit but an action by the United States to enforce the reduction, and the Court issued the requested injunction. Several states bordering on the Mississippi River were allowed to file briefs in favor of the diversion, and in the Supreme Court they objected that their interests were not considered by the Secretary of War when he issued his order reducing the flow. Mr. Justice Holmes said, for a unanimous court,

> The interest that the river states have in increasing the artificial flow from Lake Michigan is not a right, but merely a consideration that they may address to Congress, if they see fit to induce a modification of the law that now forbids that increase . . . . The Secretary, by his action, took no rights of any kind.

It is true that in a later case the Court ruled indirectly that an illegal and unauthorized diversion of navigable waters did give a state a cause of action. In Wisconsin v. Illinois (278 U.S. 367, 1929) the Great Lakes litigation was renewed by the six lake states. The Secretary of War had issued a new permit that allowed Chicago to divert a much larger amount to carry its sewage down the Mississippi. This caused a 6-inch drop in the lake levels and damage to structures, resorts, fishing and hunting grounds, parks and riparian property, and the loss of 3,346,000 tons of freight by reducing the draft of cargo vessels using the connecting locks and canals. The only issue in the case, however, was the legality of the Secretary's order; there was no discussion of the nature of the plaintiff's rights. Since the Secretary of War was not empowered to permit withdrawals of navigable waters for purposes of sanitation and power production, the order was held illegal and an injunction was issued, to take effect as soon as Chicago could construct adequate treatment plants.

This is far from any case contemplated in this report, as there are no suggestions that any predicted depletions of the Missouri River would be illegal. It should also be noted that the downstream Mississippi states again intervened in the suit, but were again sent packing. The Court said, "In our view of the permit of March 3, 1925, (the one held illegal) and in the absence of direct authority from Congress for a waterway from Lake Michigan to the Mississippi, they show no rightful interest in the maintenance of the diversion." It should be noted that this does not weaken the authority of the Sanitary District case, where despite the fact that the original diversion was authorized by an order which the Court and every one before it treated as lawful for all purposes, it was held that the river states had no rights.

The biggest issue relating to the "right" of the Lower Basin states to continued benefits from navigation, of course, is whether such a right can be asserted in view of the express words of the O'Mahoney-Millikin Amendment. The proposition that no such right exists is bolstered by some of the legislative history. During hearings on the Pick-Sloan Plan by the Senate Committee on Commerce, Congressman (later Senator) Francis Case of South Dakota testified at length and introduced a report of the Engineering Subcommittee of the Missouri River States Committee, composed of the state engineers or equivalent officers of all the basin states. The report approved the plans of the Bureau of Reclamation and the Corps of Engineers as a broad framework, disagreed somewhat with the figures used by the

federal agencies, but concluded, "We believe that reservoir storage in the basin can be provided which could effect reasonable regulation between wet and dry periods." However, the engineers indicated the tentative nature of their report as follows:

> Time will indicate more accurately the quantities of water required for the various uses in the basin. At this time the Bureau of Reclamation cannot determine definitely the acreage that ultimately will be irrigated, nor when complete irrigation development will be accomplished, nor what the ultimate consumptive use of water will be. Likewise, the army engineers cannot determine definitely the amount of water required to maintain a navigation channel. As construction proceeds and details are developed, your subcommittee believes that the states of the basin, through the Missouri River States Committee . . . should continue active, and thus work with the federal agencies throughout the period of development of the basin. (Hearings on H.R. 4485, Subcommittee of the Committee on Commerce, U.S. Senate, 78th Cong., 2d Sess., 194 (hereinafter "Hearings"), p. 588.)

Representative Case had suggested in the House that the companion Rivers and Harbors Bill, which authorized the channel works, be amended to include, "Provided, that nothing in this Act shall be construed as creating below Sioux City any demand upon the water resources of the Missouri River Basin above Sioux City in excess of that now authorized by existing law." The following colloquy took place:

> Representative Case. And it is what we all have had in mind: That this Congress, if it would, should not and could not fix rigidly the pattern for the economic development of the Missouri Valley. Fifty years from now when the maximum irrigation demand may be in existence there may be no navigation demand . . . . Because we cannot solve all the problems and rigidly define the use for every last drop of water seventy-five years from now is no excuse for not doing something now.
>
> Senator Millikin. The difficulty with that is, Congressman, as I see it: If we were enacting here or authorizing a few little projects as we did in times past, perhaps there would be no practical problem. The (Bureau of) Reclamation has a full-scale development program. This bill and the river and harbor bill represent something beyond any plans that have ever been conceived of before, and, as you develop these plans, true it takes a long time to develop them to their maximum, but as you develop them you are vesting interests which you cannot overturn lightly. As I pointed out the other day, you take navigation

here if people are figuring on a 9 foot channel or a 12 foot channel and, assuming, Congressman, that that reflects a conflict of water use -- I don't know whether it will or not; the figures are so conflicting here that I cannot reach a decision. But assume that it would. In the meantime they have built their barges, they have built their docks, they have established their track sidings. They have built their wharves, they have built all of the accessories, and would then be claiming to be a vested interest recognized by Congress. Now these are the things that we got to guard against.

Representative Case. . . . I have that concern too, and that was why I appeared before the Rivers and Harbors Committee in the House and said that as a very minimum I feel you should put in this law a provision that nothing in this Act -- referring to the Act which was proposed to be established with 9 foot channel -- nothing in the Act should be construed as creating below Sioux City any rights above those now authorized by law. In other words, that that project should not create any vested, any additional interest, any rights down here (indicating on map) that did not now exist . . . . That language happens to be the language that was adopted, but as I have said I have no pride of authorship in it; and if the Senator can suggest better and more protective language that will not produce a lot of litigation, I would like to see it done.

. . . .

Senator Millikin. Congressman Case, would you object to this language by way of substitution of your own, as far as priority of use is concerned? Use for navigation -- that is all we are talking about, in connection with the operation and maintenance of such works herein or hereafter authorized for construction on waters west of the 97th meridian shall be subordinate to or shall not adversely affect at any time beneficial consumptive use west of the 97th meridian of such water for domestic, irrigation, mining, and industrial purposes?

Representative Case. Personally I should like to see something like that done, if the use of the word "subordinate" in there does not just open the way for endless litigation and subject this project to endless delay. (Hearings, 604-609.)

When the Flood Control Act of 1944 and the Rivers and Harbors Act of 1945 were passed, the Case Amendment was gone and the O'Mahoney-Millikin Amendment was in both Acts. Thus, the legislative history shows that the O'Mahoney-Millikin Amendment includes the principle of the Case Amendment, and reaffirms the point that neither the state nor the transportation

industry acquired any rights to the navigation provided by the 9-foot channel of the Rivers and Harbors Act or the construction of the main stem reservoirs under the Flood Control Act.

Power Losses. The question whether there can be a legal claim for loss of federally generated power has never been litigated. That there will be a future reduction in hydroelectric power produced is undisputed. Every acre-foot of depletion above Fort Peck will bypass the turbines and generators at six dams; every acre-foot diverted and consumed from the Yellowstone will miss the power plants at Garrison, Oahe, Big Bend, Fort Randall, and Gavins Point. The effect will be felt generally in all states of the basin, and to some extent outside it. Whether it will give the lower basin states a ground of suit is doubtful.

In three cases, out-of-basin diversions in upstream states have caused complaints of loss of future power production (Connecticut v. Massachusetts, 282 U.S. 660, 1931; New Jersey v. New York, 283 U.S. 336, 1931; New York v. Illinois, 274 U.S. 488, 1927). In all of these cases relief on this ground was denied. The cases are not strictly in point, however -- in none of them were the power facilities constructed and in operation. Perhaps an inference could be drawn that if injury to existing plants had occurred, a legal claim would exist -- that is, an injury to the power companies by depriving them of their state's share of the water. This would be comparable to depriving an irrigator of water. On the Missouri, however, there are no private installations that could claim such injury. The production facilities are owned by the federal government, but since the federal government, through its contracts and projects, will be the largest depletor of water, it will make no complaint.

The power generated at the federal dams is marketed by the Department of the Interior's Western Area Power Administration (WAPA). Since most of the power is sold at very low rates to "preference customers" (municipal power plants and cooperative producers), those distributors will lose this advantage and will have to purchase much more expensive stream-generated power in order to supply their customers. WAPA's contracts obligate the preference customers to pay a capacity charge for each kilowatt of load demand and an energy charge per kilowatt-hour delivered at about 6 mills per kilowatt-hour. The approximate market rate for replacement power is 30 mills. This gives neither the preference customers nor the ultimate consumers any cause of action. Investor-owned utilities buy power from WAPA at approximately market rates, hence they would suffer no loss. WAPA's contracts provide an expiration date and furnish other methods of termination. None of the municipalities, cooperatives, or investor-owned utilities that are direct recipients of WAPA power, nor the people, firms, and industries who are the ultimate customers have anything like a "right" to continue power service at WAPA rates. There may be expectations or hopes that these advantages will continue, but any rise to the status of a right is doubtful.

Environment. Environmental damage has been claimed by injured states in several cases. In Wisconsin v. Illinois (278 U.S. 367, 1929) the master found that "damage due to the diversion at Chicago relates to . . . the convenience of summer resorts, to hunting and fishing grounds, to public parks . . . and to riparian property generally." New Jersey has sued New York (283 U.S. 473, 1931) for dumping into the Atlantic garbage that wound up on New Jersey beaches, and again (256 U.S. 296, 1921) for discharging sewage into New York Harbor. New Jersey has won both times. Neither of the above was an equitable apportionment case. But New Jersey v. New York, (283 U.S. 336, 1931) was the "eastern apportionment case" in which New Jersey alleged that New York's diversion of the Delaware River would injuriously affect the sanitary conditions of the river, injure the shad fishing, increase the salinity in Delaware Bay to the injury of the oyster fisheries, and injuriously affect the river for recreational purposes.

No objection was raised that any of these claims were improper or could not be made by these states for the benefit of their citizens. Considering the fact that the cases date from the 1920s and 1930s, there seems little question that today the states may, on behalf of their citizens, make demands for the protection of the environmental elements on the lower Missouri, if the harm is of the type that state action allowed upstream or that state action could prevent. Cumulative effects of private action might be in this class. But if the environmental harm came from new federal projects or federal contracts to supply water from existing projects, the government would have to comply with the National Environmental Policy Act and file environmental impact statements (see Environmental Defense Fund v. Andrus, 596 F.2d 848, Ninth Cir. 1979). If after full compliance with NEPA the decision is nevertheless made to proceed with the project or sale, environmental harm provides no substantive grounds for halting the federal action. (Environmental Defense Fund v. Corps of Engineers, 470 F.2d 289, Eighth Cir. 1972; see Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, 435 U.S. 519, 1978).

Time of Suit

None of the scenarios for future development of the Missouri River Basin shows depletions by the year 1990 that could produce an interruption of navigation services, even if there occurred a repetition of the 1930s drought. If the downstream states were to bring an action in the next decade to prevent the infliction of harm -- even one that also sought an allocation of water to states and purposes -- it seems doubtful that such a suit would be successful. A suit in that form would be inviting the application of the rule previously discussed, that the Supreme Court will act only if the plaintiff state can show that the defendant state has inflicted or threatens to inflict serious harm on existing water uses.

By the turn of the century, however, development may have proceeded along the lines of Scenarios 1B, 1C, 3A and perhaps 2A; upstream depletions will have made substantial inroads into the navigation season and power production; and the 2 to 3% probability of a severe drought will have become a present threat to the continued existence of the water transportation industry. This would meet one test but raise another problem. If the lower basin states wait until the upstream developments have already occurred, with works built, land irrigated, and energy projects constructed, it would be very difficult to halt the depletions at the cost of throwing away such a tremendous investment. The downstream states might find that their suit was barred by laches (unconscionable delay) or by estoppel (legal bar to a claim) on the ground that it would be inequitable to now seek an injunction after standing by and failing to object to the developments. The Supreme Court has twice applied such rules. In Washington v. Oregon (297 U.S. 517, 1936, the Court applied the law of priority across the state line. Washington contested the validity of an Oregon priority near the line, on the ground that it was wasteful. The method of diversion was a crude spreader dam, in use fifty years. The Court said, "Not until 1930 was there a claim (by Washington) . . . . Without a sign of challenge the Oregon users were allowed to develop their little settlement in the faith that their enjoyment of the waters was uncontested by anyone." The Court sustained Oregon's contention that the Washington claim was barred by "laches and abandonment."

In the second dispute over the Arkansas River, Colorado v. Kansas, Colorado had, since the first adjudication, steadily increased its uses from the river without objection by Kansas. Colorado brought the suit to enjoin private litigation between farmers in Colorado and Kansas, and Kansas counterclaimed for an apportionment that would have required many Colorado irrigators to cease operations. The Court criticized Kansas on the ground, "While improvements based on irrigation went forward in Colorado for twenty-one years, Kansas took no action until Colorado filed the instant complaint in 1928. Those facts . . . gravely add to the burden (Kansas) would otherwise bear, and must be weighed in estimating the equities of the case."

There are therefore good reasons for not waiting for harm to be actually committed. Too long a delay may be fatal. Yet there are dangers in acting too soon and having the suit dismissed as premature.

A possible escape from this "Catch-22" of too soon or too late may occur if the future harm takes a definite form and the expectancy of its occurrence shifts from impending to imminent. It has never been literally true that the lower state must wait for physical injury to occur. Several suits have been triggered by the start of a single large project that will, when completed, invade the rights of the downstream states. In Wyoming v. Colorado the downstream state did not wait for harm to occur but sued to

halt a project for an interbasin diversion. The diversion was a present threat to existing uses, and work was in progress on the project. New Jersey v. New York, the eastern apportionment case, was brought to enjoin a particular large project for interbasin diversion. Such a suit might be triggered by a project in Montana, one that was definite, planned, and proceeding toward fulfillment, and would take so large a quantity of water as to tip the balance from a scenario that does not threaten navigation in the year 2000 (1A, 2B, or 3B) to one that does (1B, 1C, or 3A). A real occasion for such a suit might arise below Montana --the High Plains-Ogallala Aquifer project (Scenario 4). Although the diversions are downstream, they are of such magnitude as to call for a joinder of all the states in the basin to determine where the impact should fall and whether all states should not divide the burden of the shortage thus caused.

Many depletions will be small individually but large in total. How much of a threat is needed, how protracted the harm may be, how many small increments may be added together, are perhaps subject to litigation and redefinition. In the Arkansas River litigation Kansas twice stood by and saw Colorado slowly steal essentially all the water of the river except for local supplies that arise in Kansas, leaving no share of the original river for her. As small depletions mount toward a possibly harmful total, the Supreme Court might listen with a sympathetic ear to a complaint that the lower basin states were being "nickeled and dimed to death," and that their share of the water could be whittled away to the point where a drought would kill navigation unless they now (1990?) get a ceiling on depletions that would guarantee them a perennial navigable flow at Sioux City.

On the other hand, more than the first step is needed. Officials of several lower basin states have expressed opposition to the 1982 water rights and contracts for the ETSI pipeline diversion from Oahe Reservoir of 20,000 acre-feet per year, and it was reported that possibilities of a suit were being investigated. While this is a tiny fraction of the Missouri's flow, the stated objection is that the project sets a precedent for larger future projects that could make serious inroads on the river. No authority for such a suit against a "threat of a threat" is known. While there may be exceptions to the rule requiring the threat of serious harm to present uses (discussed below in relation to suits by upstream states and suits to divide unappropriated water), such a suit to declare a principle does not fall within them.

Grounds for Apportionment

Although most of the cases have started out as suits to prevent harm, the other side of the coin has not been wholly neglected. In the two biggest interstate water cases the Court has dealt at length with the proposition that an excess of claims over supply presents a "case or controversy" that calls for equitable apportionment. As noted above, in

the North Platte case, Nebraska v. Wyoming, three justices dissented on the ground that no present harm was shown. The majority opinion of the Court on this point, therefore, is worth a long quotation:

> As we have noted, Colorado moves to dismiss the proceeding. She asserts that the pleadings and evidence both indicate that she has not injured nor presently threatens to injure any downstream water user. She emphasizes the large increase since 1910 in acreage under irrigation in Wyoming and Nebraska as compared with the increase in Colorado. She asserts there is a surplus of water in the stream, as evidenced by the fact that during the recent drought or dry cycle the Kendrick Project in Wyoming and the Tri-County Project in Nebraska have been constructed, indicating that the sponsors considered that the available water supply was not entirely used by existing projects. And she emphasizes that during the drought there was a divertible flow passing Tri-State Dam during the irrigation season. The argument is that the case is not of such serious magnitude and the damage is not so fully and clearly proved as to warrant the intervention of this court under our established practice . . . The argument is that the potential threat of injury, representing as it does only a possibility for the indefinite future, is no basis for a decree in an interstate suit since we cannot issue declaratory decrees.
>
> We fully recognize those principles. But they do not stand in the way of an entry of a decree in this case.
>
> The evidence supports the finding of the Special Master that the dependable natural flow of the river during the irrigation season has long been over-appropriated. A genuine controversy exists. The States have not been able to settle their differences by compact. The areas involved are arid or semi-arid. Water in dependable amounts is essential to the maintenance of the vast agricultural enterprises established on the various sections of the river. The dry cycle which has continued over a decade has precipitated a clash of interests which between sovereign powers could be traditionally settled by diplomacy or war.
>
> The original jurisdiction of this Court is one of the alternative methods provided by the Framers of our Constitution.

(The Court here recited the claims of each state and indicated some of the conflicts.)

> What we have then is a situation where three States assert against a river, whose dependable natural flow during the irrigation season has long been over appropriated, claims based not only on present uses but on projected additional uses as well. The various statistics with which the record abounds are inconclusive in showing the existence or extent of actual damage to Nebraska. But we know that deprivation of water in arid or semi-arid regions cannot help but be injurious. That was the basis for the apportionment of water made by the Court in Wyoming v. Colorado, 259 U.S. 419, 66 L.Ed. 999, 42 S.Ct. 552, supra. There the only showing of injury or threat of injury was the inadequacy of the supply of water to meet all appropriative rights. As much if not more is shown here. If this were an equity suit to enjoin threatened injury, the showing made by Nebraska might possibly be insufficient. But Wyoming v. Colorado, supra, indicates that where the claims to the water of a river exceed the supply a controversy exists appropriate for judicial determination. If there were a surplus of unappropriated water, different considerations would be applicable. Cf. Arizona v. California, 298 U.S. 558, 80 L.Ed. 1331, 56 S.Ct. 848. But where there is not enough water in the river to satisfy the claims asserted against it, the situation is not basically different from that where two or more persons claim the right to the same parcel of land.

Arizona v. California started out as a suit for an equitable apportionment, although the Court found other grounds for its decision. That case went even further than Nebraska v. Wyoming, and settled conflicting claims not to an over-appropriated river, but to the unused waters of the Colorado River. Several portions of the long opinion bear on this question:

> The basic controversy in this case is over how much water each state has a legal right to use out of the Colorado River and its tributaries . . . .

All "present perfected rights" were confirmed. The doctrine of equitable apportionment was not applied to the balance, since the case was governed by the Colorado River Compact and the Boulder Canyon Project Act. Although there was no motion to dismiss, the Court did address the question:

> Our jurisdiction to entertain this suit is not challenged and could not well be since Art. III, Sec. 2, of the Constitution gives this Court original jurisdiction of actions in which States are parties. In exercising that jurisdiction, we are mindful of this Court's often expressed preference that, where possible, States settle their controversies by "mutual

accommodation and agreement." (Citing Colorado v. Kansas and Nebraska v. Wyoming). Those cases and others (citing Kansas v. Colorado and New Jersey v. New York) make it clear, however, that this Court does have a serious responsibility to adjudicate cases where there are actual, existing controversies over how interstate streams should be apportioned among States. This case is the most recent phase of a continuing controversy over the water of the Colorado River, which the States despite repeated efforts have been unable to settle. Resolution of this dispute requires a determination of what apportionment, if any, is made by the Project Act and what powers are conferred by the Act upon the Secretary of Interior. Unless many of the issues presented here are adjudicated, the conflicting claims of the parties will continue, as they do now, to raise serious doubts as to the extent of each State's right to appropriate water from the Colorado River System for existing or new uses. In this situation we should and do exercise our jurisdiction.

This is a long way from, "The governing rule is that this Court will not exert its extraordinary power to control the conduct of one state at the suit of another, unless the threatened invasion of rights is of serious magnitude and established by clear and convincing evidence." (Connecticut v. Massachusetts.) The cases requiring the infliction or threat of present or imminent harm probably represent an early stage of the development of equitable apportionment doctrine. They obviously cannot be taken too literally today. Perhaps a trend can be discerned. The first step away from the present injury theory was the substitution of the existence of the threat of imminent harm. The next was the willingness of the Court to settle excessive claims on over-appropriated waters, to insure that those with the better right got the water -- a sort of quiet title process to determine the ownership of a physically present asset. The last is the extension of the quiet title notion to the future right to develop or take possession of unappropriated water. A fair summary might be that in the earliest cases equitable apportionment was seen as tort law, the prevention of physical injury to existing uses. The later cases seem to move toward property law, the identification and quantification of assets held for the production of wealth, and the protection of expectations in the exploitation of resources.

Basis of Division

Prior Appropriation

In the first case in which a true apportionment was made, Wyoming v. Colorado (259 U.S. 419, 1922), the Court explicitly adopted prior appropriation as the basis for dividing the water because that was the internal law of both states:

> We conclude that Colorado's objections to the doctrine of appropriation as a basis of decision are not well taken, and that it furnishes the only basis which is consonant with the principles of right and equity applicable to such a controversy as this is. The cardinal rule of the doctrine is that priority of appropriation gives superiority of right. Each of these states applies and enforces this rule in her own territory, and it is the one to which intending appropriators naturally would turn for guidance. The principle on which it proceeds is not less applicable to interstate streams and controversies than to others. Both states pronounce the rule just and reasonable as applied to the natural conditions in that region; and to prevent any departure from it, the people of both have incorporated it into their constitution. It originated in the customs and usages of the people before either state came into existence, and the courts of both held that their constitutional provisions are to be taken as recognizing the prior usage rather than creating a new rule. These considerations persuade us that its application to such a controversy as is here presented cannot be other than eminently just and equitable to all concerned.

With a minor exception, Nebraska v. Wyoming (325 U.S. 589, 1945) also applied the law of prior appropriation to settle the shares to an interstate river. The flow of the North Platte River fluctuates from flood to rivulet within each year, as well as from fat years to lean years. Some junior projects would be out of priority in some seasons and in periods of drought, so prior appropriation was made the basis of a complicated decree that enforced the law of priority across state lines. Wyoming was required to regulate instate juniors in favor of out-of-state seniors, to enforce intrastate priority in favor of a senior dam that stored water for use in Nebraska. In a reach of the river with many diversions in two states, a percentage division was made on the basis of the percentage of junior and senior rights.

In Washington v. Oregon, the parties stipulated that the Walla Walla River should be governed by the law of prior appropriation. The application of priority in that case led to a denial of an apportionment and a dismissal of the action, since the Court found no violation by Oregon of Washington's priorities.

Lastly, priority was applied to deny an upstream state the right to make future uses that would take water from present downstream uses. Another sub-controversy in Arizona v. California involved the Gila River, and really should be called "New Mexico v. Arizona." The Gila arises in New Mexico and flows into Arizona. The river as a whole is overappropriated, since the supply of water is not sufficient to supply the demands of all existing projects. In the course of adjudicating it the master said,

New Mexico also claims the right to water for future requirements. It is here, however, that priority has its greatest effect. It would be unreasonable in the extreme to reserve water for future use in New Mexico when senior downstream appropriators in Arizona remain unsatisified. It was so held as to Colorado's claim in Nebraska v. Wyoming.

Protection from Threatened Harm

In those cases in which the Court has heard the complaint of a downstream state that the upstream state threatens its present interests with substantial harm, and has granted relief by way of injunction against the upstream activity, something very like prior appropriation has been applied under the guise of "protection of rights" or "equitable apportionment," although the Court purports to be using some other and quite different law. The injunction against the diversion of the Delaware River to New York City to protect New Jersey's existing oyster fishery, and the injunction against the diversion of Lake Michigan by Chicago to protect the existing navigation and environmental interests of the other Great Lakes states, are hardly distinguishable from the injunction against the diversion of the Laramie River through the Colorado tunnel to protect existing irrigation on Wyoming ranches and farms.

The rule works much the same way where the upstream state develops first, like Massachusetts' diversion to Boston, which the Court gave a better right than the one for Connecticut's unbuilt hydroelectric power plant in Connecticut v. Massachusetts. In Kansas v. Colorado the Court refused to apply the law of appropriation between the states, yet Colorado, by "getting there fustest with the mostest," got practically all the water and Kansas' future junior uses were foreclosed. This treatment was repeated in the later phase of the Arkansas River controversy, when Kansas complained that Colorado diversions had increased and there was no water left for development in Kansas. Here the Court applied priority by refusing to require existing Colorado diversions to be curtailed in favor of future Kansas irrigation.

All of these cases seem to give a green light for one state or the other to develop as fast as possible -- the downstream state so it can claim injury when upstream development occurs, the upstream state so it can claim that when it acted, no injury occurred. Prior appropriation is the quintessential protection of existing rights. Normally we do not think of the use of the water for navigation, or for preserving natural conditions in the river's environment, as appropriations. Yet if "use and enjoyment" are substituted for "diversion to beneficial use," then Missouri's and Iowa's existing navigation and environmental conditions have priority over the upper basin's future depletions for mining and energy, whether called appropriations or not, and regardless of the law the Court purports to apply.

Exceptions to Priority

Even in the western states priority does not always equal equity. The Supreme Court has made exceptions where enterprises and communities have been built on junior appropriations, not challenged when started but attacked many years later in a suit brought primarily for other purposes. But the Court has hinted at a broader rule of equity, applicable in other situations. In Nebraska v. Wyoming Mr. Justice Douglas expressed a famous, oft-quoted dictum:

> That does not mean that there must be a literal application of the priority rule. We stated in Colorado v. Kansas that in determining whether one state is "using, or threatening to use, more than its equitable share of the benefits of a stream, all the factors which create equities in favor of one state or the other must be weighed as of the date when the controversy is mooted." That case did not involve a controversy between two appropriation states. But if an allocation between appropriation states is to be just and equitable, strict adherence to the priority rule may not be possible. For example, the economy of the region may have been established on the basis of junior appropriations. So far as possible those established uses should be protected though strict application of the priority rule might jeopardize them. Apportionment calls for the exercise of an informed judgment on a consideration of many factors. Priority of appropriation is the guiding principle. But physical and climatic conditions, the consumptive use of water in the several sections of the river, the character and rate of return flows, the extent of established uses, the availability of storage water, the practical effect of wasteful uses on downstream areas, the damage to upstream areas as compared to the benefits to the downstream areas if a limitation is imposed on the former -- these are all relevant factors. They are merely an illustrative, not an exhaustive catalog. They indicate the nature of the problem of apportionment and the delicate adjustment of interests which must be made.

These factors led the Court to permit the continuation of Colorado diversions that were out of priority in relation to the large canals in Nebraska. The length of the river between Colorado and Nebraska meant that the travel time of water was two or three weeks, which made it highly speculative that Colorado ditches could be regulated so as to ensure delivery of the water to Nebraska canals. There was also much loss in transit, with the result that the lower appropriator would receive less than the upper would lose.

Much the same situation re-occurred in the Gila River phase of Arizona v. California. The Court again protected existing, though junior, uses in New Mexico, noting that while many of the rights would be junior to downstream Arizona rights, the master had recommended that they be not disturbed. The master had quoted from Nebraska v. Wyoming that priority is not a hard and fast rule, and identified several factors that militated against enforcement of priority: (1) reduction of New Mexico uses would result in a contraction of the economy in that state, (2) some of the water, used beneficially in New Mexico, would be lost en route to Arizona, (3) New Mexico uses only a small portion of the water she contributes to the Gila River system, and (4) New Mexico and Arizona had compromised this issue by adjusting their claims of acreage. The master stated, "It is worthy of note that the Court, in an equitable apportionment suit, has never reduced existing upstream uses by rigid application of priority of application. Indeed, the tendency has been to protect existing uses whenever possible."

These are minor variations, protecting existing rights if not enforcing priority. There never has been a real rejection of priority, a substitution of new uses for old. The only case in which such relief was asked was Colorado v. Kansas, the 1943 reprise of the Arkansas River case. Kansas claimed to have 414,000 irrigable acres for which there was no water. The master found there was a dependable flow and recommended that about 10% be allotted to Kansas and 90% to Colorado. There was no doubt that the decree would inflict serious harm on agricultural interests in Colorado, but it must have seemed to the Master that this was a case in which Colorado had exceeded her equitable share, that she must now cough up the excess that really belonged to Kansas. But the Court rejected the master's recommendation, emphasizing the loss of investment and means of support of Colorado citizens. Some development had taken place in Kansas, noted the Court, and Kansas had been dilatory in development and in attempting to enforce her rights.

Allocation to Future Uses

Quite a bit of authority could be mustered to support the proposition that future uses will not be protected in an interstate lawsuit, or put another way, that unappropriated water will not be allocated in an equitable apportionment. Since a declaration that Montana has a right to unused water free from priorities of developments in other states is exactly what Montana seeks, this rule will be a difficult hurdle to surmount.

This principle started out as a rule that water would not be set aside for mere speculative purposes. In New York v. Illinois (274 U.S. 488, 1927) New York objected to drainage of the Great Lakes on the ground that it would impair future power production on the St. Lawrence and at Niagara Falls. The Court rejected this complaint, saying,

> At best, (it) does no more than present abstract questions respecting the right of the plaintiff state and her citizens to use the waters for such purposes in the indefinite future. We are not at liberty to consider abstract questions.

This proposition was most forcibly brought out in Connecticut v. Massachusetts, (282 U.S. 660, 1931). The Connecticut River bisects Massachusetts and Connecticut. When Boston, upstream, proposed to take 2% of the water of the river, the Court denied an apportionment to Connecticut, saying that no material injury was shown to navigation, flood irrigation, or shad runs in the lower reaches. Connecticut also sought protection for a project at Kings Island, where a power company with a small dam had procured a Federal Power Commission license to build a high dam that would produce 50,000 horsepower of electric energy. Even this was held insufficient to create a right:

> It is not shown that the company has determined to do so, or that the necessary capital has been arranged for. If water power shall be developed to the extent of 50,000 h.p. the diversion will cause an injury of $80,000 . . . . At most there is a mere possibility that at an undisclosed time the owner, were it not for the diversion, might construct additional works capable of using all the flow of the river including the waters proposed to be taken by Massachusetts. Injunction will not issue in the absence of actual or threatened interference. The facts disclose no basis for relief in respect of that property.

When New Jersey sued New York over diversions of the Delaware River to New York City, Pennsylvania intervened to protect its interests, primarily water supply for the City of Philadelphia. The allegation was that Pennsylvania needed "to protect its interests as against anything that might be done to prejudice its future needs." This request was denied without any discussion: "The prayer of the intervenor, Commonwealth of Pennsylvania, for the present allocation to it of the equivalent of 750,000,000 gallons per day from the Delaware River or its Pennsylvania tributaries is denied without prejudice."

All three of the "tributary cases" in Arizona v. California (1963) dealt with this issue. In the portion of the Master's Report that involved the claims of New Mexico, Nevada, and Utah to the small streams that enter the Colorado, where these states sought a decree confirming their existing rights against mainstream users in California and reserving their rights to water for use in the future, the master said,

> Tributary uses are not now being challenged by mainstream states . . . and there is therefore no controversy over their continued enjoyment. Moreover, since no new tributary uses seem

imminent there is no need to determine whether there is water available for such uses. The Supreme Court has clearly stated that it will not . . . apportion water in an interstate stream in order to preserve it for consumption at an unspecified time in the future by one state against the possibility that another state might utilize the water first . . . .

Even if the mainstream states had asked for an injunction against increased tributary uses, it would be inappropriate to adjudicate the request at this time. Mainstream users are presently enjoying the use of tributary inflow, and there is no indication that such enjoyment is in immediate danger of being interfered with. There is no evidence that there will be, in the immediately forseeable (sic) future, any substantial increase in uses on the tributaries. Indeed, except for the proposed Dixie Project on the Virgin River in Utah, there is no evidence of any pending proposals or plans for the construction of specific works involving the increased use of water on any of the tributaries. At best, the evidence shows only vague general hopes for growth and development on the tributaries.

The Dixie Project itself cannot be considered an immediate threat to the continuation of present tributary inflow into the mainstream. There is no evidence that the Dixie Project will be developed except as a federal reclamation project, yet its authorization by the United States is far from certain. The Regional Director of the Bureau of Reclamation for Region Three has twice issued favorable reports on the proposed project to the Commissioner of Reclamation, but the latter has not yet approved it. So far as the evidence shows, the proposed project has not even been brought to the attention of the Secretary of the Interior or of Congress, and congressional approval is required before the project can be developed. Moreover, the Regional Director's approval of the Dixie Project was conditioned on Utah fulfilling certain conditions which have not yet been met.

In this state of the record, principles established by the Supreme Court dictate that mainstream rights to tributary inflow ought not now be adjudicated.

In that phase dealing with the rights of Nevada, New Mexico, and Utah on the small streams, the master said:

It is equally clear that rights of tributary users _inter sese_ to make increased uses of tributary water in the future ought not to be adjudicated. There is presently unused

> water . . . . The record indicates that none of the tributary states will be able to use this water in the immediate future, and Supreme Court precedent requires that it not be reserved for one user against the possibility that another may appropriate it first.

The most damaging statement by the master was made in connection with another phase of the Gila case:

> New Mexico also claims the right to water for future requirements. It is here, however, that priority of appropriation has its greatest effect. It would be unreasonable in the extreme to reserve water for future use in New Mexico when senior downstream appropriators in Arizona remain unsatisfied. It was so held as to Colorado's claim in Nebrasaka v. Wyoming, 325 U.S. 589 (1945).

These holdings lose some of their value as precedents because a compromise between Arizona and New Mexico on the Gila eliminated most of the controversy, and no state filed exceptions to the report that would have required the Supreme Court to review these recommendations and affirm or reverse them. They are therefore similar to the rulings of a lower court, never appealed.

A possible escape from the no-apportionment-of-unappropriated water rule on the Missouri is to speak of uses, not appropriations. All of the water of the Missouri is used downstream for navigation, power production, recreation, and other instream purposes. Upstream claims for future depletive uses are not merely claims to unappropriated water; they are claims that coupled with the downstream claims for instream use, exactly meet the grounds held sufficient in Nebraska v. Wyoming: " . . . there is not enough water in the river to satisfy the claims against it."

Suit by Montana

Nature of Suit

A suit brought by Montana against the other states of the Missouri Basin would be an unusual but not inconceivable step. Under certain circumstances the state might feel that it was essential to take legal action to determine her rights, rather than to proceed in ignorance of the law or to leave the timing of the decision to others. If downstream states found it to their advantage to move ahead without a declaration of rights, if downstream developments threatened to turn into prior appropriations, if private development or public funding were inhibited by uncertainty, there could be need for Montana to take action, to get an allocation for her future needs before all of the available unappropriated water is put to

use or spoken for. It is conceivable that a situation could arise in which Congress would be unwilling to authorize or construct a project in Montana until the legal effect of the O'Mahoney-Millikin Amendment is determined by the Supreme Court.

If for one reason or another the O'Mahoney-Millikin Amendment is determined not to be operative as an allocation, and not to authorize serious impairment or destruction of navigation by upstream depletions, then something like Scenario 1A at year 2000 levels could be dictated by law. The upper basin would be restricted to total depletions of 1,625,000 acre-feet per year in order to maintain a permanent navigable flow at Sioux City, a stringent limitation on upstream development. The allowable depletion would have to be divided among North Dakota, South Dakota, Wyoming, and Montana, and the question becomes, what would Montana's share of the upper basin's share be under these conditions? Another scenario, 3B, permits navigation to continue throughout a drought, at lower levels of downstream depletion. But continuation of navigation correlates closely with upstream depletions, and merely lowering the downstream depletion does not decrease the upper basin's share to any substantial degree. While it would allow an increase in the length of the navigation season in the average year, it would not avoid the loss of navigation during a drought. (Figure III-2.)

The question might arise in another form, requiring less than a formal allocation of all of the waters. If the viability of a single large project in Montana was in issue, it might be unnecessary to decide that Montana gets W%, North Dakota X%, South Dakota Y%, and Wyoming Z%. All that might be needed would be a declaration that the project would be within Montana's share. To put the shoe on the other foot, perhaps Montana might seek a declaration that if South Dakota were to proceed with the development of a large project, it would be without prejudice to Montana's right to increase irrigation of her lands and other depletions, i.e., that the project would be beyond South Dakota's fair share of the river.

Still another form of the question might arise under Scenario No. 4, sometime after 1990, if depletions are then increasing at medium levels in both upper and lower basins, plans for the proposed "Exxon" diversion to the Colorado River for energy development are proceeding apace, and a northern segment of the High Plains-Ogallala Rescue Project is a possibility. Navigation would still be maintained at approximately current levels, but the combination of diversions out of the upper basin and depletions within the upper basin, plus depletions in the upper portions of the lower basin (the Platte and Kansas sub-basins), would soon threaten the continuation of navigation. If the Wyoming and Dakota projects are under way, and Montana's share of the upper basin's depletions look farther down the road, when the Montana depletions are made they could appear to be the straw that broke the camel's back. Before this happens, Montana might want

to bring a suit that says in effect, "Leave a share for us," that is, that equitable apportionment of unappropriated water is not a race to priority and some water can be set aside for future uses.

Basis of Suit

Such a suit faces formidable legal obstacles. It runs counter to the requirement that physical harm must be committed or threatened, it rejects the priority basis for equitable apportionment among prior appropriation states, and it calls for the apportionment of unappropriated water. It might nevertheless succeed. It would be a major step in the trend toward treating equitable apportionment as the identification and quantification of property rights, comparable to quiet title actions among peaceable claimants to land.

The Requirement of Injury May Be Inequitable. The "rule" that a state must show harm or the threat of harm cannot, consistently with equity, be applied to an upstream state developing more slowly than its neighbors. If it were strictly applied, equitable apportionment would disappear as a legal process declared and enforced by the Supreme Court. All cases would be decided by the race for priority. The state that first got the projects would get the water.

If Montana could not bring such a suit because it could not show that it was or was about to be physically deprived of water for an existing project, then the downstream states might divert, consume, deplete, and use instream at will the total flow of the Missouri, and Montana would have no ground for complaint. Yet if that was done, and if Montana then attempted to initiate a consumptive use or out-of-basin diversion, the lower states could argue that the "physical injury" rule gives them a cause of action to enjoin the injury to their uses. In that case Montana would be deprived of the consumptive use of the water just as surely as if by some magic the lower basin states had dried up the stream above them. They would have it all, Montana would have none; equality of right would be completely destroyed, the apportionment would be all to the lower states and none to Montana. Yet obviously a present injury can result from deprivation of future benefits. A loss of future means of growth can be as much an injury to a state as is the loss of a benefit enjoyed in the past.

Priority is Not Always Equity. Where a stream is overappropriated and existing uses in both states exceed the annual supply, priority is a fine and just rule. It has been applied by specifically ordering states to give priority to particular projects over others, and by giving each state a mass allocation or a percentage allocation that will approximate priority between the states so that state officials can distribute each state's share according to its own priority rule. (Wyoming v. Colorado, Nebraska v. Wyoming.) But the choice of a priority rule to protect existing uses

does not necessarily require an unbending application of priorities to future uses. In Wyoming v. Colorado priority was applied to protect existing uses from interference by a new out-of-basin diversion, and in Nebraska v. Wyoming, to divide an overappropriated stream among the claimants. In these cases priority was equity. This does not mean that priority of appropriation requires that for future development the rule of priority be applied in a devil-take-the-hindmost race for the water. If priority is the sole law of equitable apportionment, equity lies with the state that first develops and the state in which development is slower will get only the leavings. This would make equitable apportionment a mockery, and give the river to the state that acts first. Such equality would be nothing but an equal opportunity to join in the race, something obviously not intended.

In the Gila River phase of Arizona v. California, the master said, "New Mexico also claims the right to water for future requirements. It is here, however, that priority has its greatest effect." He went on to say, "it would be unreasonable in the extreme to reserve water for future use in New Mexico when senior downstream appropriators in Arizona remain unsatisfied." New uses will not be allowed to take water from senior users. But he did not say, and the Court in confirming this phase of the case did not say, that priority is the sole rule for unappropriated waters.

Rights to Unappropriated Water. In the first case named Arizona v. California (283 U.S. 423, 1931), the Supreme Court said,

> There is no occasion for determining now anyone's rights to interstate or local waters which have not yet been, and which may never be, appropriated. This Court cannot issue declaratory decrees.

That was not an equitable apportionment case. The suit was filed by Arizona against the Secretary of the Interior, seeking to halt construction of Hoover Dam; the other states were made parties because they would be affected by the decision. The opinion primarily discussed the powers of Congress over navigable waters. But Arizona did complain that her future development would be foreclosed by the construction of the dam and the implementation of the Boulder Canyon Project Act, and this dictum has been cited in interstate cases.

Yet the basis for the Court's statement has long since disappeared. The declaratory judgment is a relatively modern legal device invented for just this situation. When there is disagreement between parties as to which is in the right, there is no need for one to act and then be hauled into court to see if he committed a wrong. The parties can go to court and get their rights declared. "Instead of taking a step in the dark, we turn on the light to see if the path is safe." The Federal Declaratory Judgment Act now provides: "In a case of actual controversy within its jurisdiction

. . . any court of the United States . . . may declare the rights and other legal relations of any interested party." (22 U.S.C.A., Sec. 2201.)

Indeed, exactly this has been done. The most recent interstate lawsuit was by an upstream state, since any intake for the Central Arizona Project (not then authorized) would be above the major aqueducts and canals that took much of the Colorado River to Southern California's groves and cities. Arizona asked for nothing but a declaration that her title to 3,800,000 acre-feet of water be confirmed. A million acre feet was for the Gila Valley, practically all appropriated, and this was awarded to her. The other 2,800,000 acre feet was almost wholly unappropriated water in the main stem, claimed as a future supply for the Central Arizona Project, if it was ever to be built. As it turned out, the case was not decided on equitable apportionment grounds, but the Court's treatment of the jurisdictional questions is nevertheless in point. In taking the suit, the Court said:

> The basic controversy in the case is over how much water each state has a legal right to use out of the Colorado River and its tributaries . . . . This Court does have a serious responsibility to adjudicate cases where there are actual, existing controversies over how interstate streams should be apportioned among states . . . .
>
> Unless many of the issues presented here are adjudicated, the conflicting claims of the parties will continue, as they do now, to raise serious doubts as to the extent of each state's right to appropriate water from the Colorado River system for existing or new uses. In this situation we should and do exercise our jurisdiction.

A Return to Equity. A suit by Montana would ask the Supreme Court to declare a truly equitable, court-decreed apportionment of the Missouri River, rather than to merely referee priorities.

The Supreme Court might be persuaded that such a suit, even though it skipped over procedural rules dictated by the form of some earlier suits, would be a return to first principles. If development in Montana is to be foreseeably slower than in downstream states, then a set-aside share for her is necessary if the leading principle of Kansas v. Colorado is to be fulfilled:

> One cardinal rule, underlying all the relations of the states to each other, is that of equality of right. Each state stands on the same level with all the rest. (There must be) an equitable division of benefits . . . . between the two states resulting from the flow of the river.

It would bring to life the great words of Mr. Justice Holmes in New Jersey v. New York:

> A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it. The upstream state has the power to cut off all the waters within its jurisdiction. But clearly the exercise of such a power to the destruction of the interests of the lower states could not be tolerated. And on the other hand equally little could New Jersey (downstream) be permitted to require New York to give up its power altogether in order that the river might come down to it undiminished. Both states have real and substantial interest in the river that must be reconciled as best they may be.

A declaration of the "real and substantial interests" of Montana would enable Montana's projects to proceed along planned lines, to meet foreseen need, at the pace dictated by orderly development.

Colorado v. New Mexico

A case that is currently in the process of decision may have a very important bearing on the problems faced by Montana. Colorado, on the headwaters of the Vermejo River, seeks an apportionment of those waters with New Mexico, into which they flow. The case was filed on November 27, 1978. (Colorado v. New Mexico, 439 U.S. 975, 1978.) No motion to dismiss or other preliminary ruling preceded the reference to a master. Three weeks of testimony were taken. On January 4, 1982 the master filed his report with the Supreme Court. No briefs have been filed by the parties on exceptions to the report. The case will in all probability be argued in the fall of 1982 and a decision will be reached sometime between March and July, 1983.

The Vermejo's main watershed is an almost inaccessible mountain valley in Colorado. None of its water is put to beneficial use in Colorado. In 1976 a single Colorado appropriator, the CF&I Steel Company, procured a conditional decree (roughly equivalent to a permit) for a transdivide diversion of 75 cubic feet per second for industrial and beneficial uses in the Purgatoire Valley in eastern Colorado. Conflicting estimates of the yield run between 3,600 and 4,700 acre-feet per year.

Nearly all of the water that now reaches New Mexico is totally consumed there by a dude ranch, a coal mine, two operating ranches, and a small conservancy district. Today only small amounts reach the Canadian River to which the Vermejo was a tributary.

Colorado's principal legal argument is that no state can control the

entire flow of an interstate stream, that each state has a sovereign right to a share of the water. New Mexico claims that the entire flow of the Vermejo has been previously appropriated in New Mexico. As counter-arguments, Colorado replies, (1) that its diversion would cause no harm to some New Mexico users and that reasonable conservation procedures and stricter legal regulation of water rights by New Mexico would offset any losses caused to others, and (2) that prior appropriation is not the only method of reaching an equitable apportionment.

The master recommended that Colorado be awarded a transmountain diversion of 4,000 acre-feet per year. The very brief narrative statement of the evidence is critical of the low values of the New Mexico uses and the inefficiency of water use on the 65 farms within the irrigation district, . . . "which should never have been built . . . the district has not met any payments (to the Bureau of Reclamation) for the project for many years, . . . most of the farmers have fulltime or parttime jobs elsewhere."

The master's recommendation was supported by a very short, very general legal analysis, reviewing the equitable apportionment cases one by one and making the following points:

> (1) Simply stated, the doctrine (of equitable apportionment) says that each state is equal to all of the others, and as quasi-sovereign, each state is entitled to a share of a river flowing between them. Each is entitled to benefit from the interstate river flowing within its borders. (Report of Special Master, p. 8.)
>
> (2) It should be noted that the facts of this case establish that the Vermejo Conservancy District does not have an economically feasible operation. There is no competent evidence which would indicate that the district will ever be able to meet its debts and live up to its expectations, and for this reason, the impact of a Colorado diversion on New Mexico users, as a whole, would be minimal. (P. 10.)
>
> (3) If the Master were to apply the doctrine of appropriation as it is applied in these two States, Colorado would not receive any Vermejo water. To so hold would permit one of the factors used in making an equitable apportionment to destroy the guiding principle itself. Carried to this extreme, priority of appropriation would prevent an equitable apportionment from occurring.
>
> The diversion requested by Colorado would take approximately one half of the water produced in that State. Any

damages to New Mexico must be weighed against benefits which will accrue to Colorado. CF&I Steel Corporation is a major employer in southern Colorado and northern New Mexico. The proposed use to which CF&I would put the water would have economic repercussions throughout the economy of the area. (P. 17.)

(4) The unique circumstance which confronts the Master in this case is Colorado's failure to divert water and put it to beneficial use at any time in the past. New Mexico has applied the water and has existing economies which are dependent on the water. Although these particular facts are unique . . . . This overriding principle, combined with the other factors of this case, such as the nature of the existing economies in New Mexico, persuades the Master that there is no reason to depart from the basic principle of equitable apportionment. (P. 21.)

(5) In a sense, Colorado has a junior appropriation in the form of an inchoate water right. The Court has often held that senior water rights may be subrogated to junior water rights so that equity may prevail. In this case, the entire equitable apportionment principle would become meaningless if the Master were to decide that Colorado was not entitled to any Vermejo waters because she had not used any of them in the past.

It is the opinion of the Master that a transmountain diversion would not materially affect the appropriations granted by New Mexico for users downstream. A thorough examination of the existing economies in New Mexico convinces the Master that the injury to New Mexico, if any, will be more than offset by the benefit to Colorado.

The Master is of the opinion that the evidence presented demonstrates that sufficient water is available for (the ranches). The flows at the Dawson Gauge indicate sufficient water to meet the needs of all three corporations regardless of which State's figures are used.

The Vermejo Conservancy District has never been an economically feasible operation. Payments for the project have not been made for many years and the possibility of future payments being made is remote. Most of the people in the area have income from sources other than farming and ranching.

> To deny Colorado a share of that which she produces would appear to the Master to be inequitable. (Pp. 22-23.)

The Special Master's Report is therefore a precedent of a somewhat transient nature for several propositions of importance to the Montana situation. If the Supreme Court should adopt the Master's Report and affirm it in all respects, the case would be a new precedent on the following points:

(1) It is a suit by an upstream state that has not yet put water to use.

(2) No present use of water in the plaintiff state is harmed. (Colorado made an ingenious argument that the burden would still be on the downstream state to prove that downstream interests would be harmed.)

(3) It decrees a fund of water for what is essentially a future appropriation in that state.

(4) It is an extreme example of balancing the benefits and awarding the water to the state showing the greater gain. The master is apparently willing to sacrifice whatever benefits exist in the 65 farms (and there could be benefits as long as the capital debts are not paid).

(5) It is the first example of a state having actually put to use more water than is eventually decreed to it, and having to give up a portion of its prior appropriations for junior appropriators in a sister state.

It is possible, however, that the Master's Report could be reversed on several procedural or substantive grounds. The master did not analyze the evidence; there are practically no findings of fact. It would not be surprising if the Court rejects the Report and sends it back rather than having to struggle through the record itself. The master makes no choices between conflicts in the evidence. Colorado argued that New Mexico's claims were exaggerated and based on decrees, not actual use. She also argued that New Mexico's irrigation practices were wasteful and that a "closed system" of improved works would allow the use of less water in New Mexico and make it available for use in Colorado, relying on the rule that requires an appropriator to have a reasonable means of diversion. But there are no findings that indicate that these facts are true or that these economies would enable New Mexico's appropriators to continue beneficial uses on whatever land is actually irrigated. If the diversion really takes a substantial source of income from the New Mexico farmers, the Court might well hold that the master erred in allowing an upstream future use to do so much harm to existing downstream uses.

There are other possible sources of error. The master's allocation to Colorado takes the form of a mass allocation that would give Colorado first choice on the water of the river and cast all the burden of shortage on the New Mexico appropriators. It is not likely that the Court would repeat the mistake it made in the mass allocation in Wyoming v. Colorado and reverse the priorities in this fashion.

If the master is reversed, the Supreme Court's decision would not necessarily be completely unfavorable to positions Montana may wish to take. If it is held that Colorado cannot make a valid claim for future upstream use to a share of a river already fully appropriated in a downstream state, this would strengthen the inference that equitable apportionment is largely a form of prior appropriation. But that would be protection of existing uses by priority -- not the same proposition, as above noted, as apportioning unappropriated waters in accordance with priority. It would still be possible to argue that an upstream state should have a fair chance to compete for the unappropriated water, other than to race for it.

Procedure

The Constitution provides, Article III, Section 2, "The judicial power shall extend . . . to controversies between two or more states . . . . In all cases . . . in which a state shall be a party, the Supreme Court shall have original jurisdiction." Interstate controversies over waters have been likened to international disputes that could lead to wars between nations, but which must be otherwise handled because the Constitution makes wars between the states impossible and imposes this judicial substitute. (Kansas v. Colorado, 185 U.S. 125, 1922.)

The nine justices of the Supreme Court are too busy to sit at trial, hearing weeks of testimony about river flows, water rights, irrigable lands, etc. Instead, each case is referred to a Special Master who is authorized to receive further pleadings, hold hearings, summon witnesses, issue subpoenas, and take or call for evidence presented or required, and who is directed to file appropriate reports. These usually recite or summarize the evidence and contain findings of fact, conclusions of law and a recommended decree. (See, for example, Idaho v. Oregon, 431 U.S. 952, 1977.) The parties take exception to those rulings that go against them, and the full Court receives briefs and hears argument on these points. The procedure before the Supreme Court is therefore not unlike a hearing on an appeal from a lower court.

The master is allowed his actual expenses and costs of technical and stenographic assistance and of printing his report. Lately the Supreme Court has appointed retired federal judges as masters, possibly because they remain on full salary, while the fees of the two prominent lawyers who

served successively as the master in Arizona v. California totalled $185,000, paid by the party states.

Parties. When the citizens and residents of one state take enough water from a river to injure the farms and enterprises of citizens of a downstream state, grounds for an ordinary lawsuit exist, and several such cases have been litigated between individuals on opposite sides of a state boundary. (See Bean v. Morris, 221 U.S. 485, 1931.) If the persons causing harm defend their acts as lawful under the laws of their state, however, that state and its officials may need to be made parties so that a judgment for the plaintiff could require that such laws not be administered so as to cause the harm. Since the Eleventh Amendment prohibits citizens of one state from suing another state, the injured person would be remediless but for the doctrine of parens patriae. The state, acting as "guardian of the people," can take up their cause where the injuries rise above a mere question of local right and threaten the prosperity and general welfare of the state. (Kansas v. Colorado, 206 U.S. 46, 1907.) Thus the controversy moves to the level of a cause between states within the jurisdiction of the Supreme Court. The plaintiff state is there by virtue of parens patriae, the defendant state because it is or may be an offending party.

The joinder of other parties does not affect the jurisdiction of the Court. Intervening plaintiffs are unwelcome where they could be represented by the parent state. Philadelphia was not allowed to enter a suit to which Pennsylvania was already a party. (New Jersey v. New York, 345 U.S. 369, 1953.) But for enforcement purposes the practice seems to be to join private defendants who might be constructing works that would interfere with the complaining state's equitable share. In Wyoming v. Colorado two Colorado corporations planning an out-of-basin diversion were joined, and in New Jersey v. New York the City of New York was made a defendant for the same reason. In Arizona v. California (373 U.S. 546, 1963), which started as an equitable division suit, the public agencies claiming California's share of the Colorado River were joined.

Necessity of Joinder of United States

In all probability, any suit to distribute the waters of the Missouri River among the states of the basin, to determine the share of the river to which each state is entitled, to declare the right of a state to deplete the river through the actions of its citizens and licensees, or to have the river remain undepleted by persons in other states, must include the United States as a party. An "indispensable party" to a suit is a person or other legal entity whose interests will be bound by the suit or will be directly affected by the operation of the judgment. The United States, as the proprietor and operator of the main stem dams, as the owner of the power produced, as the builder of other projects on the river and its tributaries, and as the provider of irrigation, municipal and industrial water,

would seem to be an indispensable party to any suit for an equitable apportionment, any suit to enjoin the construction or operation of a project, and any suit to require the release of water for navigation. The federal government must be in the suit in some capacity, whether as a plaintiff, as a defendant, or as an intervenor. The major difficulty, however, and the possible factor that could prevent any such suit from proceeding, is that the United States cannot be made a party against its will. It may voluntarily choose to join the suit, or it may bring the proceedings to a halt by choosing to stay out of it or to withdraw from it.

It is true that not every apportionment case has required the presence of the United States. In the first, Kansas v. Colorado, the United States filed a petition of intervention, asserting that the flow of the river was subject to the superior authority and supervisory control of the United States. The Supreme Court, in holding that the states had the right to the flow of the river and that water law for reclamation of lands was state law, came within an inch of declaring the Reclamation Act unconstitutional. The national government had no general power to control the whole system of reclamation of arid lands, said the Court, and, for that purpose, to appropriate the accessible waters. The Court did concede that the U.S. had extensive powers over navigable waters, but the Arkansas was not navigable in the reach of the river in question. The power of the government over its territories and public lands was recognized, but the Court noted that the Secretary of the Interior must comply with the state law in acquiring water rights for reclamation projects. The doctrines of riparian rights and prior appropriations were described, but the Court held, "Congress cannot enforce either rule on any state." The upshot was that the petition of the United States to intervene was denied, "without prejudice to the rights of the United States to take such action as it shall deem necessary to preserve or improve the navigability of the Arkansas River."

No attempt was made by plaintiff or defendant states to draw the United States into the Laramie River litigation between Wyoming and Colorado or into the suit by Washington to divide the Walla Walla River with Oregon; the United States did not intervene in or object to those suits. Those rivers are not navigable and the United States has no projects on them. Rather curiously, the United States, which had brought one suit to enjoin the Chicago Sanitary Canal diversion, did not intervene in or object to the subsequent Great Lakes cases, and the Supreme Court in Wisconsin v. Illinois merely noted that, "All action of the parties and the Court in this case will be subject, of course, to any order that Congress may make in pursuance of its constitutional powers." The United States was not involved in the other eastern cases involving the out-of-basin diversions to Boston and New York of the Connecticut and Delaware Rivers.

On the North Platte River the Bureau of Reclamation had two projects,

the North Platte Project, with Pathfinder and Guernsey Reservoirs and the Interstate and Fort Laramie canals that irrigated lands in both Wyoming and Nebraska, and the Kendrick Project, with Seminoe and Alcova dams and the Casper Canal for Wyoming lands. In an early stage of the litigation, Wyoming moved to dismiss the action on the ground that Nebraska had failed to join the Secretary of the Interior, alleged to be an indispensable party. The Court denied the motion:

> The bill alleges, and we know as a matter of law, that the Secretary and his agents, acting by authority of the Reclamation Act and supplementary legislation, must obtain permits and priorities for the use of water from the state of Wyoming in the same manner as a private appropriator or an irrigation district formed under the state law. His rights can rise no higher than those of Wyoming, and an adjudication of the defendant's rights will not necessarily bind him. Wyoming will stand in judgment for him as for any other appropriator in that state. He is not a necessary party. Nebraska v. Wyoming, 295 U.S. 40 (1935).

However, the United States did voluntarily enter the litigation at a later stage. In 1938 it intervened, asking for an allocation of a portion of the river to itself to enable it to manage its reclamation projects free from state control. The Court denied an apportionment to the United States, but did recognize that it was a proper party to urge protection of its claims to stored water and to efficient management of the projects.

The latest case between states seeking an equitable apportionment of the benefits of the flow of a river was held not to require the presence of the United States (Idaho v. Oregon and Washington, 100 S.Ct. 616, 1980). This sounds like an important precedent, but the case involved a division of the fishing rights in the Columbia and Snake rivers and the opinion furnishes little guide to the problems faced on the Missouri, holding only that the interests of Indian tribes, for whom the United States is trustee, did not make the government an indispensable party.

On the Colorado River, the United States blocked the first attempt of Arizona to secure an equitable apportionment. Suit was brought in 1936 against all the states in the entire basin, but the United States refused to give its consent to be sued. In dismissing the case, the Supreme Court recited the fact of the navigability of the stream and the enactment of the Boulder Canyon Project Act, and many of its statements would be pertinent to an attempt of the states of the Missouri Basin to divide that river:

> Without more detailed statement of the facts disclosed, it is evident that the United States, by congressional legislation and by acts of its officers which that legislation authorizes, has undertaken, in the asserted exercise of its authority to

control navigation, to impound, and control the disposition of, the surplus water in the river not already appropriated. The defendant states contend, and Arizona does not deny, that the natural dependable flow of the river is already over-appropriated, and it does not appear that without the storage of the impounded water any substantial amount of water would be available for appropriation.

The decree sought has no relation to any present use of the water thus impounded which infringes rights which Arizona may assert subject to superior but unexercised powers of the United States . . . The prayer is for a decree of equitable division of the privilege of future appropriation. The relief asked, and that which upon the facts alleged would alone be of benefit to Arizona, is a decree adjudicating to petitioners the "unclouded . . . rights to the permanent use of" the water. Such a decree could not be framed without the adjudication of the superior rights asserted by the United States. The "equitable share" of Arizona in the unappropriated water impounded above Boulder Dam could not be determined without ascertaining the rights of the United States to dispose of that water in aid and support of its project to control navigation, and without challenging the dispositions already agreed to by the Secretary's contracts . . . .

Every right which Arizona asserts is so subordinate to and dependent upon the rights and the exercise of an authority asserted by the United States that no final determination of the one can be made without a determination of the extent of the other. Although no decree rendered in its absence can bind or affect the United States, that fact is not an inducement for this Court to decide the rights of the states which are before it by a decree which, because of the absence of the United States, could have no finality.

In the latest case named "Arizona v. California," the United States finally chose to intervene. (344 U.S. 19, 1953).

The most instructive litigation concerns the Rio Grande. The suit was initiated in 1951 by Texas against New Mexico, alleging breach of the Rio Grande compact of 1938 which was negotiated among Colorado, New Mexico, and Texas in settlement of earlier litigation. In 1952, a master was appointed. He held long hearings and filed a report in 1954 and a supplemental report in 1955. After all this, in 1957, the Supreme Court dismissed the suit without a written opinion because of the absence of the United States as an indispensable party. (Texas v. New Mexico, 352 U.S. 991, 1957.) The government had had the matter under advisement for some time, and it can only be speculated that the Department of Justice decided

the judgment would control the operation of the Rio Grande irrigation project and the operation of Elephant Butte Dam, and that the executive branch of the government determined that this was more appropriately the business of the Bureau of Reclamation than of the United States Supreme Court. On the Missouri, the refusal of the United States to join would be in effect a decision that the matter was one for Congress, not the Court.

Congress has made the decision in some instances. Consent has been granted to the joinder of the United States, as a defendant or otherwise, in a suit by any state of the Colorado River Basin to enforce compliance by the Secretary of the Interior with certain compacts and laws in the storage and release of water from reservoirs in the basin. (Colorado River Storage Project Act, Sec. 14, 43 USCA Sec. 620m.) This consent has been repeated in the legislation authorizing the Navajo and San Juan-Chama projects, (43 USCA Sec. 615vv), and the Fryingpan-Arkansas Project, (43 USCA Sec. 616d).

Aside from sporadic examples of congressional waiver such as these, and general waivers in cases falling within the jurisdiction of the Court of Claims or within the Federal Tort Claims Act, the doctrine of sovereign immunity is alive today. While it may be waived, and the United States may consent to be sued or may voluntarily intervene in litigation, there are no statutory or judicial guidelines as to when the consent or waiver will be given. Apparently the entire matter is within the sole discretion of the Attorney General, as the lawyer for the United States, though he may be guided by the advice of his subordinate clients, the Bureau of Reclamation and the Corps of Engineers.

The conclusion cannot be escaped that on the Missouri River the United States would be an indispensable party. Through the Corps of Engineers it operates the huge dams on the main stem, and through the Bureau of Reclamation it controls the upstream reservoirs and irrigation projects and administers contracts for the municipal and industrial use of the water in both the tributary and main stem reservoirs.

Suits in Lower Courts

There are possibilities that major issues which could arise in an equitable apportionment suit might be heard in a different type of suit in the lower federal courts. The Judicial Code translates the constitutional provision into the statutorily created court system as follows: "(a) The Supreme Court shall have original and exclusive jurisdiction of: (1) all controversies between two or more states . . . (b) The Supreme Court shall have original but not exclusive jurisdiction of: . . . (2) All controversies between the United States and a state . . . . " (28 U.S.C.A. Sec. 1251.) When the Supreme Court has concurrent jurisdiction with the lower courts it may choose to take the case or to deny leave to file the action. In U.S. v. Nevada and California (412 U.S. 534, 1973), the United

States, acting on behalf of an Indian tribe, had a dispute with Nevada over the waters of the Truckee River. Nevada had negotiated a compact with California, in which the river arose, and under certain circumstances the dispute could broaden to include California. The United States asked leave to file the case in the Supreme Court, but the Court said,

> There is now no controversy between the two states with respect to the Truckee River. The complaint, therefore, as the United States concedes, is not one alleging a case or controversy between two states within the exclusive jurisdiction of this Court, under 28 USC Sec. 1251(a), but a dispute between the United States and two states over which this Court has original but not exclusive jurisdiction under Sec. 1251(b)(2). We seek to exercise our original jurisdiction sparingly . . . . We deny the motion, but without prejudice to refiling it should the posture of the litigation change in a manner that presents a more substantial basis for the exercise of our original jurisdiction.

That case was sent to the District Court of the United States for the District of Nevada, but it presents the interesting possibility that if the United States felt the necessity of determining its rights against the states of the Missouri Basin it might initiate the action. Since rights of the states <u>inter se</u> would be antagonistic, the Supreme Court would have grounds to take jurisdiction over the controversy, but it might choose not to do so. The possibilities and advantages of procedure in the lower federal courts, however, can only be the subject of speculation.

Suits by environmental groups against officers and agencies of the United States are generally treated as an exception to the rule of sovereign immunity. See, for example, <u>Environmental Defense Fund</u> v. <u>Andrus</u> (598 F.2d 848, 9th Cir. 1979). Such a suit in a federal district court could not be brought against a state, nor could the state be made a codefendant in a suit against the United States, because the Eleventh Amendment prohibits suit against a state by citizens (or organizations) of another state. Yet if, for example, the O'Mahoney-Millikin Amendment should be attacked in such a suit, states in the Missouri Basin might seek to intervene to insure that their interests were adequately represented. The state of Montana, acting through the Department of Natural Resources and Conservation, intervened in <u>EDF</u> v. <u>Andrus</u>, supra, in which other aspects of the Flood Control Act of 1944 were involved.

<u>Alignment of Parties</u>

A suit to apportion the Missouri River might take several forms, and each of these might subdivide again. The parties might line up in several different ways, depending on the circumstances.

The most likely type of suit will be one to protect the navigation on

the reach of the river below Sioux City. As noted above, losses due to curtailment of hydroelectric power production from the main stem reservoirs, if they are to be counted at all in the type of harm that will give relief, will be generalized and felt throughout the basin, but they will fall hardest on the more heavily populated lower regions. Environmental harms are primarily "parasitical damages," in the sense that they occur as side effects of the loss of navigation. The states whose principal interests are in water for navigation and environmental protection are Iowa and Missouri. Kansas and Nebraska might find themselves in an ambivalent position. They would suffer from the loss of navigation, yet they have much to gain from future depletions in the North Platte and Kansas River basins. They have particularly strong interests in the High Plains-Ogallala interbasin diversion scheme.

On the defendant's side of a general apportionment suit, Montana would be a prime target, as contributor of 48% of the flow of the river at the head of navigation. However, in any action taken to prevent one or more variations of Scenarios 1, 2 and 3, which lead to substantial reduction of navigation and its possible demise in case of drought, Wyoming, North Dakota, and South Dakota will certainly be co-defendants.

Wyoming might seek to be excluded. It is the only state upstream from Montana, on the Yellowstone River, whose waters have been allocated between the states of Wyoming, Montana, and North Dakota by the Yellowstone River Compact. She might claim an analogy to the North Platte case, Nebraska v. Wyoming, (325 U.S. 589, 1945), from which the Laramie River, a major tributary of the Platte, was excluded by the parties with the notation that those waters were previously apportioned between Colorado and Wyoming by the decree in Wyoming v. Colorado (259 U.S. 496, 1922), and that the previous apportionment was in no way affected by the North Platte suit. But the mere prior division of a tributary does not *ipso facto* exclude it from an apportionment of the mainstream. As a matter of practical fact, the Laramie was overappropriated and had contributed little but return flows to the Platte since the turn of the century. But here Wyoming contributes 38% of the main stem water entering Lake Sakakawea in North Dakota below the Montana state line, which is 28% of the flow at Sioux City. There is substantial unappropriated water in her share of the Bighorn, Tongue, and Powder rivers, the main tributaries of the Yellowstone, and major depletions of those streams are projected. Since depletions above Garrison show a very high correlation with the loss of navigation, there seems to be no ground on which Wyoming could claim to be shielded by the compact from the claims of a downstream state which was not a party to the compact.

Depletions will occur in the upper reaches of the Platte and Kansas rivers and their tributaries in Colorado, Kansas, and Nebraska. It is possible that these states might be made original defendants in a suit by

Iowa and Missouri, or they might be "impleaded," brought in as additional defendants, by Montana, Wyoming, and the Dakotas, if sued alone. Since these lower basin depletions will have relatively insubstantial effects in producing the major harms (see Scenarios 2A and 2B, Table III-20 and III-21 and Figures III-1 and III-2), the main stem states might not try to sue Colorado, Kansas, and Nebraska, or the Court might exclude them under the ruling in an early phase of the North Platte case. In Nebraska v. Wyoming (295 U.S. 40, 1935), Wyoming moved to dismiss Nebraska's suit against her, relying as one ground on the lack of Colorado as an indispensable party. The mere fact that the North Platte rises in Colorado and drains a considerable portion of the state does not make Colorado an indispensable party, said the Court. Nebraska asserted no wrongful act on the part of Colorado and asked for no relief against her. She was not therefore a necessary party to the dispute between Nebraska and Wyoming concerning the respective priorities and rights of their citizens in the water of the river. (Colorado was, of course, later joined, impleaded by Wyoming, who alleged substantial out-of-priority uses in Colorado.)

Projected major interbasin diversions from the Missouri River that start out as withdrawals from Oahe Reservoir would be South Dakota appropriations, and ordinarily a diversion is counted against the share of the state in which it is made. In the North Platte case, however, some storage and diversion in Wyoming were parts of projects that irrigated Nebraska lands. This water was treated as part of the allocation to Nebraska, and Wyoming was ordered to honor their priorities. The High Plains-Ogallala project would confer major benefits in Nebraska and Kansas, less in Wyoming and Colorado, and it would probably be more fair to charge the water to the recipient state than to the state where the diversion was made. Oklahoma, Texas, and New Mexico would also receive water from the project, but it seems fanciful to call this their "equitable portion" of the Missouri River.

A single identifiable project such as this, one that would have such a major effect all by itself, could be the target of the suit that called for an injunction against it, rather than a general allocation of all of the water to all of the states. It is not at all certain, however, that a lawsuit which started like this would end up in that posture. The suit would inevitably involve the question of whether the O'Mahoney-Millikin Amendment permits the destruction of navigation by future beneficial consumptive uses. This is an issue in which every upstream state has an interest and in which they would seem to be indispensable parties. If the upper basin were to lose on this issue, and an injunction protecting navigation below Sioux City was to be issued, the necessity of allocating the allowable depletions (with or without the interbasin diversion) would immediately arise.

It should be noted that there is no in-basin protection in the

O'Mahoney-Millikin Amendment. The projected interbasin diversions would quite clearly be beneficial consumptive uses preferred by the Amendment. The High Plains-Ogallala diversion and the Exxon diversion to the Colorado are both located west of the 98th meridian. Aquifer recharge and energy development are beneficial uses for irrigation and industry. The uses are totally consumptive, regardless of whether there would be any residue after use, since water taken beyond a divide is 100% consumptively used insofar as the in-basin users are concerned. (Twin Lakes Reservoir and Canal Co. v. Aspen, 568 P.2d 45, Colorado 1977.) The fact that water would end up across the Continental Divide in Colorado and out of the Missouri Basin into Oklahoma, Texas, and New Mexico seems irrelevant to the major purpose of the amendment, whatever other arguments might be made against the diversions.

Form of Decree

As noted above, in either a general adjudication to determine the equitable apportionment of the Missouri River or in a suit to enjoin the major interbasin diversions, the lower basin states would hope to secure a decree that required enough water to be delivered at Sioux City to enable navigation to be continued at approximately current levels and protected from a drought-induced suspension that might cripple the water transportation industry. This would be an allocation of something like Scenario 1A or 3B at year 2000 levels. In either case, this would put severe limitations on depletions, and it seems inescapable that the total permissible depletions would have to be distributed among the other states. At that point, the allocation would undergo a major shift in form, and would become quite like a suit among the upper basin states to distribute the upper basin's share among them in much the same fashion that the Laramie and North Platte rivers have been divided.

The North Platte decree is of little use as a precedent for the Missouri. It contained a number of operating rules for managing an over-appropriated river with a large number of reservoirs and diversions in many differing localities. It contained permission for some upstream out-of-priority uses, several injunctions against increasing irrigation, storage, or transmountain diversions, an order to observe intrastate priorities to protect projects diverting water upstream for the benefit of the downstream state, and a percentage allocation to approximate interstate priority in the reach of the river heavily drawn on by many ditches, each state to divide the waters according to its own set of priorities. New Jersey v. New York, sometimes called the eastern apportionment, ended in a partial injunction that allowed a projected interbasin diversion up to the point at which harm was foreseen. The Laramie decree could offer an analogy. The suit was in form an action to enjoin Colorado and two corporations from carrying out a single interbasin diversion that would interfere with Wyoming's water rights and uses. The Court determined the

total of existing priorities in both states and the dependable flow of the river, found there was a surplus of 15,500 acre-feet per year, and enjoined the defendants from taking more than this amount. However, the decree allowed to Wyoming all the water the Court thought it was entitled to, and gave to Colorado enough for existing uses and the tunnel diversion, so that in effect, if not in form, it was a mass allocation to the upstream state which could then take the total of all existing diversions plus the limited amount for the new one.

It should be noted that this turned out very badly for Wyoming. By giving the upper state a "mass allocation" which it can take each year, the entire burden of shortage in normal supply is cast upon the downstream state. A decree on the Missouri allowing each state to take a certain amount of water would probably have the same effect, and would not accomplish the desired purpose of protecting navigation in a repetition of the 1930s drought. A decree that split not the water but the permissible future depletions would not have that effect. It would be relatively easy to enforce, since in each state diversions are allowed only under permit from the state water officials who could set a ceiling on depletions beyond which new projects could not go.

CONGRESSIONAL APPORTIONMENT

Source of the Doctrine

Until the decision in Arizona v. California (373 U.S. 546, 1963), the division of interstate waters had been accomplished by one of two methods. One was the lawsuit between the states, brought in the Supreme Court under the original jursdiction given by Art. III of the Constitution. The other was the interstate compact entered into pursuant to Art. I, Sec. 10. Each depended on a theory of equitable apportionment of the benefits of the river, and each was a well-known and well-used legal mechanism. In Arizona v. California, the master invented and the Supreme Court accepted and declared the doctrine of congressional apportionment, a third method of interstate allocation, theretofore unknown. The Court said,

> We agree with the Master that apportionment of the Lower Basin waters of the Colorado River is not controlled by the doctrine of equitable apportionment or by the Colorado River compact. It is true that the Court has used the doctrine of equitable apportionment to decide river controversies between states. But in those cases Congress had not made any statutory apportionment. In this case, we have decided that Congress has provided its own method for allocating among the Lower Basin states the mainstream water to which they are entitled under the compact.

This was a new and startling doctrine, one never before announced, and one never since applied. Arizona v. California remains the single identified example of this means of dividing water. Since Arizona v. California is the one and only case, a thorough analysis of it is in order.

On its face the case seemed to involve the doctrine of equitable apportionment, yet it was complicated by the joint allocations made to the states of the upper and lower basins by the Colorado River compact and further complicated by the question of the applicability of portions of the Boulder Canyon Project Act of 1928. The compact allocated one-half of the river, 7.5 million acre-feet, to the lower basin and an equal amount to the upper basin, with other stipulations not material here. California claimed 4.6 million acre-feet, Arizona 3 million, and Nevada 0.3 million. These claims totalled 400,000 acre-feet above the fund of water allowed to the loewr basin by the compact. Arizona had refused to sign the compact. To settle the matter sufficiently to allow the project to proceed, Congress in the Boulder Canyon Project Act authorized the construction of Hoover Dam on one of two contingencies: (1) if all seven states ratified the compact, or (2) if six, including California, ratified and California passed a "self-limitation act" restricting her uses to 4.4 million acre-feet per year. California passed such a statute. In this way, found the Court, Congress apportioned a share to California, with that state's consent. In another provision of the Act, Congress gave approval in advance to a compact between the lower basin states, under which California would accept 4.4 million acre-feet, Arizona 2.8, and Nevada 0.3. The states never entered into such a compact. However, still another provision authorized the Secretary of the Interior to contract for the storage of water in the dam and its delivery to users and made the contracts essential to the right to the use of the water. The Secretary contracted with several California irrigation and metropolitan water districts, but dealt directly with the states of Arizona and Nevada, contracting to deliver to them 2.8 million and 0.3 million acre-feet respectively. In effect, the Secretary exercised his delegated powers to force on the states the same shares they would have gotten under the proffered compact, and with California's self-limitation, the division was complete. Congress thus forced upon the states the same split of the river that the states had refused to agree upon.

The Court carefully distinguished congressional apportionment from equitable apportionment. "Where Congress has so exercised its constitutional power over waters, courts have no power to substitute their own notions of an 'equitable apportionment' for the apportionment chosen by Congress." Presumably a division made by Congress need not be equitable, or at least Congress is to determine the equities and its decision is not subject to judicial review.

This was only a partial solution. While the basic allocation assumed

that the full flow of 7.5 million acre-feet was available, in a water-short year the question would arise as to how the shortage was to be distributed. The Court ruled that Congress's delegation to the Secretary was complete and that he would divide the available water:

> While the Secretary must follow the standards set out in the Act, he nevertheless is free to choose among the recognized methods of apportionment or to devise reasonably methods of his own. This choice, as we see it, is primarily his, not the master's or even ours . . . . We cannot accept California's contention that in case of shortage each state's share of water should be determined by the judicial doctrine of equitable apportionment or by the law of prior appropriation. These principles, while they may provide some guidance, are not binding upon the Secretary where, as here, Congress, with full power to do so, has provided that the waters of a navigable stream shall be harnessed, conserved, stored, and distributed through a government agency under a statutory scheme.

Three judges dissented. California's former governor, Chief Justice Earl Warren, did not sit, so this was a 5-3 decision. The dissent thought that equitable apportionment should have determined the shares of the lower basin states in their previously undivided half of the river, and questioned the finding by the majority that Congress had in fact made such an apportionment as claimed. They argued that the Boulder Canyon Project Act granted no water to California but only placed a limit on California, that the suggested interstate compact made no apportionment since it was never adopted by the states, and that the Secretary's contracts were for repayment of financial charges, not for division of the water. One dissenting justice said that federal control of navigable waters had nothing to do with the case. Two others showed the unlikelihood of a congressional intent to apportion by quoting statements of members of Congress and committee witnesses that the only constitutional ways of apportioning the river were by suit in the Supreme Court or by interstate compact. It is interesting to note, however, that none of the dissenting judges actually questioned the power of Congress to make such an apportionment. All the discussion centered on the question of whether Congress had in fact made the division.

One strange thing about the case is that there was no discussion as to the source or extent of this newly-found congressional power, this startling addition to interstate jurisprudence. It is widely assumed that it is simply a new facet of the traditional control of the federal government over navigable waters. Congress has often exercised its powers over commerce by the regulation and protection of navigation, and it has equal power to improve navigation, to destroy navigable capacity, to obstruct the waters, to prevent the obstruction of the waters, and to license the

obstruction of the waters. These national powers are well-established and very broad. It takes very little to add to them the power to distribute the waters of the destroyed river to those persons and to those states the United States may designate.

There are other possibilities. The master, who made the first suggestion that Congress possessed and had exercised the power of allocation, said, "Clearly the United States may construct a dam and impound the water of the Colorado River, a navigable stream . . . . Clearly, also, once the United States impounds the water and thereby obtains physical custody of it, the United States may control the allocation and use of unappropriated waters so impounded." (Master's Report, p. 160.) This theory of control over impounded water could give power to apportion the waters of nonnavigable interstate streams held in federal dams. In a case not cited by the Court or by the master, Ashwander v. TVA (297 U.S. 288, 1936), the Court approved a plan to generate and sell electricity at a dam constructed primarily for navigation control, saying,

> The government acquired full title to the dam site, with all riparian rights. The power of falling water was an inevitable incident of the construction of the dam. That water power came into the exclusive control of the federal government. The mechanical energy was convertible into electric energy, and the water power, the right to convert it into electric energy and the electric energy thus produced, constitute property belonging to the United States . . . . Authority to dispose of property constitutionally acquired by the United States is expressly granted to the Congress . . . . The government could sell or lease and fix the terms.

Impounded water, not appropriated by any person, could similarly be regarded as the property of the United States, and this theory could be used to justify the distribution of water by sale to those who would enter into contractual relations with the United States. Under this property theory, congressional allocation by delegation has to some extent been authorized on the Missouri River by the 1944 Flood Control Act (33 U.S.C.A. Sec. 708), which empowers the Corps of Engineers to make contracts with municipalities, private concerns, or individuals for domestic and industrial uses of surplus water available at any reservoir under its control. At the very least, these contracts would create vested rights that would be protected by the doctrine of equitable apportionment and would fall within the share of the waters of the state in which they are located.

This property theory could be an explanation of the division of the waters stored behind Hoover Dam in Lake Mead, but it has no application to unstored water of the upper Missouri above Fort Peck or of the Yellowstone. An apportionment which included these would have to be based on the power

over navigation, which seems ample for the purpose. Though the tributaries are non-navigable, the power over the tributaries, insofar as they may affect navigability in the downstream reaches, is not open to question. The federal government can halt a state-authorized dam on the nonnavigable stretch that would lessen the flow below, (United States v. Rio Grande Dam & Irrigating Co., 174 U.S. 690, 1899) and it can build flood control projects on the smaller tributaries that protect the lands and cities on the main stem. (Oklahoma v. Guy F. Atkinson Co., 313 U.S. 508, 1941.)

Congress has made at least one other allocation of a different type. Equitable apportionment does not necessarily mean a literal division of the waters. In its initial form, in Kansas v. Colorado, it meant "the equitable apportionment of benefits . . . resulting from the flow of the river." Under the Colorado River Storage Act, the revenues from the power produced at the major dams in the upper basin in excess of the return of costs allocated to power are to be used for reimbursement of the costs of participating projects located in the states. Congress has apportioned this benefit by assigning these funds for use in the states of the upper basin in proportion to the amount of the flow of the river arising in each state. (43 U.S.C.A. Sec. 620.)

Future Apportionments

It seems unlikely that Congress would ever pass a bill for the single purpose of dividing the waters of a river between states, in the manner of a decree of equitable apportionment or a river compact. Congress will undoubtedly leave such pure allocations to the courts or to interstate cooperation. Only if there is a substantial federal purpose to be served is Congress likely to enter the picture. The federal interest most probably would take the form of authorizing water development projects. The Bureau of Reclamation and Corps of Engineers documents that describe and recommend the projects and are incorporated into the authorizing legislation might well include a recommended apportionment that would become effective on passage of the act and construction of the works. Even without an express division of the water, a project or project act containing a number of features on the same river in different states might be held to have impliedly allocated the water, if successful operation of the federal works was inconsistent with any other division that might be decreed by a court or negotiated by the states.

Dean Charles Meyers, who as "clerk" (principal researcher and writer) to the Special Master in Arizona v. California had much to do with the beginnings of the doctrine of congressional apportionment, thought that this process would be the major source of future interstate water allocations:

> Water resource development will increasingly involve river basin management, and operations will cross state lines and require large federal expenditures. Such basin development plans must necessarily come before Congress, and it is a highly appropriate time when they do so to settle interstate conflicts over water allocation. Without such a settlement development cannot go forward. (C. Meyers, The Colorado River, 19 Stan. L. Rev. 1, 1966.)

Meyers finds many reasons why congressional allocation is superior to equitable apportionment as a process for settling interstate problems. It is likely to be faster than a court case, many of which have dragged on for ten years. Congress, acting on the recommendations of economists, hydrologists, and engineers, is more likely to reach economic maximization of the resource than the Court, applying the vague standards of equitable apportionment. Projects can go forward under congressional authorizations that might be stymied for lack of a judicially-fixed supply of water. Congress can take into account the economic and political power of the contending states, yet cannot ride roughshod over the weaker states. Congress has available to it staff assistance and access to the files of the Bureau of Reclamation, Corps of Engineers, and U.S. Geological Survey, and can order special studies that may make it better informed about the nature of the problem than a court dependent on the evidence presented by the parties. Congress can make apportionments that the Court could not and that would be very difficult to reach by compact, such as inter-basin diversions to states having no legal claim to the water. On the whole, Meyers finds that apportionment is more compatible with a legislative institution than a judicial institution.

Meyers also finds advantages of congressional apportionment over the interstate water compact. Many of the compact's advantages are retained, he believes, since they would probably be negotiated by the states' water officials through their congressional delegation rather than through appointed commissioners. They would still represent compromises reached by the water resources establishment of the states. To have the settlement binding through congressional action rather than state legislative action does not change actual practice very much. A congressional apportionment deprives the state legislatures of their veto power, but some substantial residue of veto power remains in the Senate if a state seriously objects. There is some loss of citizen participation in making the decision, but less likelihood that a division could be blocked by a single party or faction.

Partial Allocations

It is arguable that a partial allocation of water to a state accompanies any federal project on an interstate river. A hypothetical case to

illustrate the point can be built from an historical example that was in fact handled differently. The original Colorado River Compact of 1922 allocated 7.5 million acre-feet per year to the states of the upper basin, subject to an obligation to deliver a like amount to the lower basin. At the close of World War II the Bureau of Reclamation announced a plan for the development of the upper basin, listing a number of possible projects in each state. However, the Secretary of the Interior announced that he would not push for congressional authorization of the projects until the upper basin states had reached agreement on their respective rights to the waters allocated to that basin. (House Doc. No. 419, 80th Cong., 1st Sess., 1947.) The Bureau had no wish to construct a project within a state and later find that that state did not have a legal claim to sufficient water for it. It should be recalled that in Nebraska v. Wyoming (325 U.S. 589, 1945), the United States had asked for a separate allocation for its Reclamation projects, independent of the allocations to the states; this request was denied by the Supreme Court. The position of the United States was held to be like that of any other appropriator of water under the laws of Wyoming, who must look to the state for protection of its interests. Under the spur of the Secretary's warning, the states quickly negotiated the Upper Colorado River Basin Compact of 1949, in which Arizona, Colorado, New Mexico, Utah, and Wyoming agreed upon the size of each state's slice of the common pie, each taking a percentage share of the upper basin's total allotment. The United States has since undertaken several of the individual projects.

Today it seems obvious that this process could be reversed. The projects could be built and the water needed by each could then be said to fall within the share of the state in which it was found. The share of each state would of necessity include at least this much; the Supreme Court would not decree a lesser amount to it. In Arizona v. California it stated, "Where Congress has so exercised its constitutional powers over waters courts have no power to substitute their own notions of an 'equitable apportionment' for the apportionment chosen by Congress." And since the only other method of allocation, interstate compact, requires the consent of Congress, it is unthinkable that Congress would in one breath authorize and appropriate money for construction of a project and in the next breath approve its destruction by an inconsistent compact. An express directive that the Bureau take a specific quantity of water and use it in a specific location for a specific purpose would seem to be an allocation of it to that land for that purpose, and one that could not be overridden by a court making an equitable apportionment or by two states agreeing to a different division of water.

In Arizona v. Colorado the Secretary of the Interior contracted with Arizona and Nevada for permanent service water deliveries of specified amounts. These were held to be congressional allocations, the legislative power having been delegated to the Secretary by the Boulder Canyon Project

Act. Numerous contracts for water service have been negotiated to supply municipal and industrial water to a state for distribution to users on its terms, or directly to the users themselves, from main stem river regulating dams or upstream reclamation projects, under authority of either Sec. 6(b) or 9(c) of the Flood Control Act of 1944, other special project acts, or reclamation law in general (for an example, see Environmental Defense Fund v. Andrus (Montana Depart. of Natural Resources and Conservation, Intervenor) 596 F.2d 848, 9th Cir., 1979). At least the contracts with states seem indistinguishable from the Boulder Canyon Project Act contracts: partial allocations to the state, protected from invasion by other states claiming an inconsistent share of the river.

Political Allocation

Just as Congress might allocate water to an upstream state by building a project that requires the water of a navigable stream, it might in a sense allocate the water downstream by refusing to undertake those works. An informal sort of congressional allocation, therefore, could result from congressional inaction. While private and state action will produce some degree of upstream depletion, federal projects -- or at least federal funds -- must be provided to produce a serious threat to downstream states. The affected local people and industries, the state governments and their Congressmen and Senators, can be counted upon, in the absence of some type of agreement or compact, to resist the authorization or funding of projects that will have adverse effects on their interests. They might seek a coalition with other states interested in navigation to resist in principle an endeavor that does not threaten them directly but that might be regarded as a precedent for other schemes that could. Environmental groups might join the alliance if their objectives coincided with navigational interests.

The Pick-Sloan Plan as an Allocation

It has been urged that the Pick-Sloan plan of the Flood Control Act of 1944 could be construed as an allocation of the water of the Missouri River Basin to the component units of the Missouri Basin Project of the Bureau of Reclamation. This seems highly doubtful. The documentary foundations of the Flood Control Act of 1944 proposed irrigation from many main stem and tributary projects, including at least twenty-two dams in Montana for irrigation of 1,200,000 acres. The tentative nature of these authorizations is detailed in a 1980 study, "The Pick-Sloan Missouri Basin Program and Individually Authorized Projects" (Proceedings, Seminar Sponsored by the Missouri River Basin Commission and the Western States Water Council, Omaha, Nebraska, October 1980):

> What did "authorization" mean in 1944? And now?

> The 1944 Act authorized the Bureau of Reclamation/Department of the Interior and the Corps of Engineers to proceed with additional studies and initiate construction within the limits of an initial appropriation to each agency of $200 million. The Act gave both agencies wide latitude to determine priorities for development, and additional authorization was only needed after the first construction appropriation had been expended.
>
> Authorization meant "authorization to construct" at the discretion of the agency head, pending completion of established feasibility studies and in concert with state and local wishes. In effect, however, projects constructed after the initial appropriation had to be "re-authorized" through the appropriations process. (Pp. 6-7.)

Only three of the Montana reservoirs are now identified in that study as "completed," three more are listed as "potential" (preliminary studies completed, project appears to be feasible technically and economically, authorization for construction not yet obtained), seven are "inactive" (determined to be economically or financially infeasible based on preliminary studies), six have been "rejected" (because of technical concerns or for purely physical reasons such as inadequate water supply), and three are "excluded" (rejected feature of larger project still under consideration). (Pp. 37-39.)

It would seem very difficult to argue that Congress intended that all the authorizations on this list carried a congressional allocation that created in the state the right to claim the total water needed for all these "projects." Something more would need to be done, perhaps appropriation of construction funds, or perhaps some other and further step to make an irrevocable commitment to the project.

The O'Mahoney-Millikin Amendment

Allocation or Not?

In any lawsuit to determine an equitable apportionment of the Missouri River, or in any negotiations for a compact to settle the rights of the states, the fundamental decision that must be made before any division can be decreed or agreed to is whether Congress, by the O'Mahoney-Millikin Amendment, guaranteed that the future development of the upper basin will not be curtailed in the interests of existing or future navigational needs. The question arises primarily in the context of whether the amendment would be a defense to a suit by downstream states or a ground for a declaratory suit brought by Montana. Yet the best framework in which to discuss the problem is in the context of congressional allocation. Is the O'Mahoney-Millikin Amendment a congressional allocation of the waters of the Mis-

souri to beneficial consumptive uses, which will occur primarily in the upper basin states, in preference to the use for navigation in the lower basin? If it is not a congressional allocation, what can it be? Is it merely a protection of consumptive uses -- primarily irrigation -- from the "navigation servitude," the traditional superiority of public navigation over private rights to use the waters?

This report concludes that it is an allocation, if not among the states, at least between purposes found in different regions. "Beneficial consumptive uses" occur primarily upstream, both on the main stem and in the Platte and Kansas sub-basins; navigation occurs in the river channel between Sioux City and the mouth. The distribution of water to these purposes will result in an allocation of water between these areas.

This conclusion is not the only one that can be reached. Strong arguments can be presented the other way. The negative approach is first dealt with. But a preliminary restatement of the setting in which the amendment was enacted is needed.

Background

In 1944, two competing plans for the post-war development of the Missouri River Basin were prepared and presented to Congress. One was proposed by Col. Lewis A. Pick, Missouri River Division Engineer, Corps of Engineers; the other was prepared by Mr. W. Glenn Sloan, Assistant Commissioner of the Bureau of Reclamation. Congress forced their merger (the famous "shotgun marriage") into the "Pick-Sloan Plan" and incorporated it into the Flood Control Act of 1944.

From the beginning it was seen that a possible conflict existed between irrigation and other upstream consumptive uses and navigation in the lower reaches of the river. The Pick Plan (H. Doc. 475, 78th Cong., 2d Sess., 1944) had addressed itself almost entirely to flood control, mentioning navigation only incidentally in referring to the purposes of the existing Fort Peck Dam and in summing up the "economic justification" for these projects:

> In addition to providing flood control benefits on the Missouri and Mississippi Rivers the comprehensive plan would also provide for the most efficient utilization of the waters of the Missouri River Basin for all purposes, including irrigation, navigation, power, domestic and sanitary purposes, wildlife and recreation. (P. 29.)

The Bureau of the Budget, in its comments on the Plan, complained that it did not make clear the relationship of these flood control and other multi-purpose projects to the 9-foot channel proposed for the

reach of the Missouri between Sioux City, Iowa, and its mouth on the Mississippi, which was being simultaneously proposed in a pending Rivers and Harbors Bill, H.R. 3961, 78th Cong. (H. Doc. 475, p. viii.)

The Sloan Plan (S. Doc. 191, 78th Cong., 2d Sess., 1944) saw the relation of its irrigation-dominated projects to navigation as primarily financial. The costs of irrigation and power features of Reclamation dams must be recovered from the water users and power customers, but their navigation features are "non-reimbursable" and need not be paid for by user fees. High allocations to navigation thus tend to improve the economic feasibility of a multi-purpose project. Senate Document 191 had this to say:

> The benefits to navigation, by providing uniform flows in the lower river, do not lend themselves to close evaluation. Operation studies of reservoirs in this plan have shown that much of the storage capacity to be provided in proposed reservoirs is required for the control of high flows, and the subsequent release of stored water at uniform rates, to provide a steadily maintained flow for navigation. Allocations of costs in some of the reservoirs have been made to navigation, for this reason. (These costs amounted to $97,245,000.) The reservoirs in the lower Missouri will be of much benefit to navigation in the Mississippi, particularly at the Chain of Rocks, where much difficulty has been experienced in the past in providing sufficient depth for navigation. The aggregate benefits for navigation have been set aside at $166,600,000.

The Chief of Engineers, in the Corps' comments to the Bureau's plan, questioned the wisdom of the large out-of-basin withdrawals contemplated, and added, "In view of the information contained in your report that the project proposed will provide a dependable low-water flow at Sioux City of something less than now exists, I do not understand the equity of charging to navigation a large part of the cost of development." (P. 7.)

In the final document that reconciled the two plans and formed the basis for the Flood Control Act, the Corps and the Bureau agreed to two principles: (1) "The Corps of Engineers should have the responsibility for determining mainstem reservoir capacities and capacities of tributary reservoirs for flood control and navigation," and (2) "As soon as substitute storage is built on the main stem of the river, the Ft. Peck Reservoir will be operated as a multi-purpose reservoir primarily in the interests of irrigation." (S. Doc. 247, 78th Cong., 2d Sess., 1944, pp. 1-2.)

But the conflict goes much deeper than mere bureaucratic wrangling over which agency should control the operation of structures. Since the

case of United States v. Rio Grande Dam & Irrigation Co. (174 U.S. 690, 1899), it has been clear that the United States, by calling upon the "navigation servitude," can protect its navigable waters from depletion, even in the form of irrigation diversions from upstream nonnavigable reaches and tributaries. It is equally clear that the navigation servitude is more than a power to protect the river, it is a restriction on the title of those who claim any right to use the waters. The servitude in its inception was just that, a public right of way over the beds of navigable waters, but it has grown to mean that persons holding land under or adjacent to navigable waters can have no private rights in the waters inconsistent with the public rights. In this view, a loss of access to or use of water suffered because of public works in aid of navigation does not entitle a person to compensation. No property is taken from the claimant to the water; rather, his title is subject to a defect, the possibility that the exercise of the superior right may diminish it. The notion that a prior appropriation water right could be lost in this fashion, without compensation, was abhorrent to those who lived where the value of farmland depended on the availability of water and the loss of irrigation water meant the loss of livelihood. Although there was no record of such a loss having actually occurred, there was good reason to fear it. In U.S. v. Chandler-Dunbar Water Power Co. (229 U.S. 53, 1913), the Supreme Court had held that when a low dam and power plant at the rapids of a navigable river had to be sacrificed to a project to build navigation locks, the government had to pay for the power plant but not the loss of the water power. The latter was the primary element of value to the company, but the Court held it had no water rights: " . . . that the running water in a great navigable stream is capable of private ownership is inconceivable."

Another factor was at work. In the west the growth of irrigated agriculture had brought a stable prosperity to replace the boom and bust of the early gold and silver mining days. The availability of water is a limiting fact on growth; if the streams were to be dedicated to nonconsumptive uses, this development would stop.

In this legal and factual setting the O'Mahoney-Millikin Amendment was added to the Pick-Sloan plan by senators from two upstream states, Wyoming and Colorado. It provides,

> The use for navigation, in connection with the operation and maintenance of such works herein authorized for construction, of waters arising in states lying wholly or partly west of the ninety-eighth meridian shall be only such use as does not conflict with any beneficial consumptive use, present or future, in states lying wholly or partly west of the ninety-eighth meridian, of such waters for domestic, municipal, stock water, irrigation, mining or industrial purposes.

Although this awkward and convoluted sentence is difficult to read, it is clear that at a minimum the Amendment was designed to eliminate the effect of the navigation servitude in the west in order to relieve irrigation farmers of the fear that the servitude would apply to them. The Amendment is clearly a guarantee that the servitude will not operate in the Missouri Basin, that irrigation ditches will not be closed to supply water to maintain a downstream navigable channel.

The question for decision is, is the Amendment more? Is it also a guarantee to the western states that their water-dependent development will not be foregone or retarded because the water that arises there must flow down into navigable channels? To state the question in its crudest form, does the Amendment give the upper basin carte blanche to deplete the river to the point that navigation cannot survive? Does it allocate the water of the Missouri over time, to navigation for the present (1944), to beneficial consumptive uses in the future (2020)?

Constitutionality

The first ground of an argument that the Amendment does not guarantee water to the upper basin for future development might be that the act is invalid. Is there any possible ground upon which the Amendment could be held unconstitutional? Does it upset the "equal footing" of the several states? This is not a constitutional doctrine, but a phrase found in enabling acts admitting states to the Union. There is no "equal protection clause" in the Constitution that guarantees equal treatment between states or proscribes changes in the balance between them. The Constitution gives Congress power to regulate commerce among the several states, and commerce includes transportation on the navigable waters. (Gibbons v. Ogden, 22 U.S. 1, 1824.) The United States has long used its powers over navigable waters affirmatively as the basis for an extensive program of river and harbor improvement projects. More recently, it has undertaken flood control activities, based on the theory that the work protects the navigable waters and navigation facilities from harm. Regulation of navigation can include the destruction of navigation by construction of a dam, and presumably as well by causing or allowing depletion by consumptive uses. The O'Mahoney-Millikin Amendment is found in both the Flood Control Act of 1944 and the Rivers and Harbors Act of 1945. It is obviously a valid exercise of all these powers.

The Supreme Court has held that the burden of these programs can fall on some states and the benefits occur to others. In Oklahoma ex rel. Phillips v. Guy F. Atkinson Co. (313 U.S. 508, 1941), the state sought to enjoin the construction by agencies of the United States of a dam and reservoir on the Red River for joint purposes of flood control and power production. The project would inundate 100,000 acres of Oklahoma land, 3,800 of which were owned by the state; it would displace 8,000 persons,

destroy productive farm land, stop the production and further development of oil resources; and it would seriously injure the state and local taxing units by causing the loss of taxable values and going concern values of the destroyed industry. The benefits of the project did not compensate Oklahoma for these losses; it was alleged that most of the power produced would be marketed in Texas, and the major flood control and navigation benefits would occur far downstream in Arkansas and below the mouth of the Red in the lower Mississippi Basin. The United States Supreme Court did not dwell on the congressional function, in authorizing the project, of balancing interests within the entire region, and the obvious unsuitability of state governments to make such a regional decision. It simply concentrated on the aspects of federal power to undertake the project and closed its opinion denying the injunction with,

> Since the construction of this dam and reservoir is a valid exercise by Congress of its commerce power, there is no interference with the sovereignty of the state . . . And the suggestion that this project interferes with the state's own program for water development and conservation is likewise of no avail. That program must bow before the 'superior power' of Congress.

A Protection Only?

Strict Construction. Arguments that the O'Mahoney-Millikin Amendment is nothing but an elimination of the navigation servitude and not a grant of power to dry up the river can be based on a very limited construction of the words of the act. It could be said that the phrase "the operation of works" shows that it is only a directive to the Corps of Engineers and the Bureau of Reclamation, merely operating instructions for the Pick-Sloan works, and not an allocation of water between states or sub-basins. In this view the O'Mahoney-Millikin Amendment does not operate in the context of interstate conflict, but only in interagency relations. It is possibly arguable that the O'Mahoney-Millikin Amendment has no application to the states of Iowa and Missouri, neither of which are wholly or partly west of 98^{0} 0" W., and that it has to do only with conflicts between those uses within the identified western states.

The amendment might be gutted by a more extensive exegesis if it fell before an unsympathetic court willing to "read it out of the act," as was done to the savings clauses in the Federal Power Act and Boulder Canyon Project Act. Under Section 9(b) of the Federal Power Act the applicant for a license to build a dam must submit "satisfactory evidence that the applicant has complied with the requirements of the laws of the state . . . with respect to the appropriation, diversion, and use of water . . . . " When Iowa refused to approve a project that clearly violated state law, the Supreme Court held that these words meant only that the applicant need submit evidence satisfactory to the Commission of steps

taken to secure state approval, and that actual compliance was required only with those laws that the Commission considered appropriate to effectuate the purposes of a federal license. (First Iowa Hydro-Electric Cooperative v. F.P.C. 328 U.S. 152, 1946.)

Similarly, in Arizona v. California, the Court ruled that Section 8 of the Reclamation Act, "The Secretary of the Interior . . . shall proceed in conformity . . . with the laws of any state or territory relating to the control, appropriation, use or distribution of water used in irrigation," meant nothing more than that the United States will pay if the Secretary takes a citizen's water rights for a project. "The effect of Section 8 in such a case," said the Supreme Court, "is to leave to state law the definition of the property interests, if any, for which compensation must be made."

A similar fate befell Section 18 of the Boulder Canyon Project Act: "Nothing herein shall be construed as interfering with such rights as the states now have either to the waters within their borders or to adopt such policies and enact such laws as they deem necessary . . . . " It might be thought that this language would preserve the states' powers of control over federally diverted and impounded waters. But no, said the Court, Section 18 merely preserves such rights as the states "now" have, that is, such rights as they then had at the time the Act was passed. Those rights were then subject to the federal government's right to regulate and develop the river, so the words are meaningless and the government may distribute the waters of Hoover Dam within the states as the Secretary of the Interior sees fit. In a somewhat similar vein, it could be argued that O'Mahoney-Millikin's protection of "beneficial consumptive use, present or future" removes the threat of the navigation servitude only as to ditches existing at the time of shortage -- ones that either existed in 1944 (present) or were constructed in the interim between 1944 and the shortage (future).

The Supreme Court has recently taken a more sympathetic view toward state laws and actually reversed the Arizona v. California construction of the Reclamation Act, in California v. U.S. (438 U.S. 645, 1978). Though this is not controlling, it does indicate a change in attitude and lessens the possibilities of construing away the Amendment.

Legislative History. The least satisfactory legislative history on the O'Mahoney-Millikin Amendment came from Senator O'Mahoney himself. From Senator O'Mahoney's remarks one might think that he was concerned only with the protection of existing rights. In one Senate debate on the first section of the flood control bill, which contained the amendment as well as the "coordinating section" (between the Corps, the Bureau, and the states), the amendment was referred to in only the vaguest terms:

> Mr. O'Mahoney. I may say for the benefit of all those who

have cooperated in the preparation of the amendment which has been designated as the O'Mahoney-Millikin Amendment, that the purpose has at all times been to protect the historic and traditional rights of the people of the west to use the waters rising in the west in the manner which has been recognized by law and by court decision for almost 100 years." (90 Cong. Rec. 8420, Nov. 27, 1944.)

Several amendments to other parts of the section were agreed to, and Senator Murray of Montana stated that he had received a number of telegrams urging his support of the amendment, and inquired whether the changes would make it necessary for him to again contact the people in Montana. Senator O'Mahoney replied,

> No; I am sure that no changes will be made which will make it necessary for the Senator from Montana to make contact with those persons because they are interested, as I am interested, and as the Senator from Montana is interested, in maintaining the rights of individuals to use the water that arises within the states. That is the objective of the amendment, it has been its objective from the very beginning, it will continue to be its objective . . . . " (P. 8420.)

When the final form of the amendment was introduced on the Senate floor, the only question raised and the only clarification made related to whether it was proper to prefer industrial uses over navigation. In a rather confusing exchange, Senator O'Mahoney answered a senator from Ohio to the effect that there would be no substantial interference with navigation by large diversions of water for industrial purposes (p. 8547). (His crystal ball was rather dim; its clouds obscured the Exxon proposal.)

During this same debate Senator O'Mahoney seemed to indicate that he saw no eventual conflict between consumption and navigation, a fact which might be taken to indicate that no preference was intended. On the floor of the Senate he explained the genesis of the Pick-Sloan Plan:

> The Army Engineers had a plan for the development of the Missouri Basin. It dealt with navigation and flood control, with incidental power. The Bureau of Reclamation had a plan for the Missouri valley which dealt primarily with irrigation and reclamation. I felt from the very outset that it would be possible for the two agencies and their engineers to sit down together and to draw a plan by which the waters of that valley could be used to conserve the interests of everybody living in the valley; that it could be developed so as to protect irrigation and reclamation, so as to provide for the development of public power, so as to provide for all feasible and possible and

> desirable navigation and so as to complete flood control. (P. 8489.)

Statements of legislators as to the meaning of statutes, made after their enactment, are of doubtful validity and utility in determining legislative intent. Thirteen years later, in 1957 hearings relating to possible increased use of the water stored behind the main stem dams for power production, Senator O'Mahoney himself was called to give his views on whether power production should be included in "beneficial consumptive uses" so as to give it a preference over navigation. Some of his remarks bore on the question of the primary intent of the amendment. In a rather rambling and sentimental statement, he included the following remarks:

> . . . when we were authorizing this structure and laying the basis for other structures, we wrote into the Flood Control Act of 1944 -- . . . we were anxious to make certain that developments downstream would not destroy the historic purpose of Congress in promoting the development of the agricultural, the mineral, the industrial, the domestic resources of the states above.
>
> The old Committee on Commerce had jurisdiction of the Flood Control Act. I appeared before that Committee (Note: the record of the hearings shows that he did not so appear) and my argument for the amendment which was finally written into law was based upon this simple concept: there never was any intention, and could not possibly be any intention, upon the part of Congress to compel the residents in the dry land states west of the 98th meridian to sit at their doorsteps and watch the water flow unused by their farms and ranches to fill new modern works below on the stream.
>
> So by the simple method of that principle, and to make sure that the water would never be used to the detriment of the basic right of the settlers of the area, we wrote this amendment.
>
> I do not see how language could be more simple or more clear. Here is a declaration that none of the projects to be constructed in the Missouri-Mississippi Basin should gain any priority over the water rights of the persons living in the area here described for domestic, municipal, stockwater, irrigation, mining or industrial purposes.
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> If anybody seeks to know what was in the minds of the sponsors of this amendment, I am here to tell them. The purpose here was to protect the water rights, without which this area could not have become the thriving center that it is today.

(Missouri Basin Water Problems, Hearings Before the Committee on Interior and Insular Affairs and on Public Works, 1957, pp. 70-72.)

Back to 1944: since H.R. 4485, the Flood Control Bill, had been extensively amended in the Senate, it was sent back to the House for repassage. The House managers accepted the O'Mahoney-Millikin Amendment and the conference report included the following:

> The Amendment also provides that in connection with the operation and maintenance of projects authorized in this Act, the use of the waters of the western states for navigation shall not conflict with beneficial consumptive use of water for domestic municipal, stockwater, irrigation, mining or industrial purposes. (78th Cong., House Report 2015, p. 6).

The conference report was accepted by both Houses with no discussion of the amendment and the bill became law. This statement is not very helpful; it contains the same ambiguity as the amendment and indicates nothing as to whether only beneficial consumptive uses in being are protected or whether future uses are to be preferred.

A Preference Also?

The O'Mahoney-Millikin Amendment, by the better reasoning, creates a preference for future consumptive uses over existing navigation uses. The positive side of the picture phrases the proposition in this way because, while it may not be certain that the O'Mahoney-Millikin Amendment is a congressional allocation of water among the states of the same kind identified in the case of Arizona v. California, it does seem clear that it creates a congressional policy that should settle the matter. If a complaint is made by a state, prior to the occurrence of shortage, that depletions from projected projects will create shortages in the future, injure the states' claimed rights to navigation, and cause concomitant environmental damage, the best prediction is that the suit will be decided against that state. This result seems quite certain, regardless of whether the O'Mahoney-Millikin Amendment is called a congressional allocation of interstate waters or a congressional policy that creates a preference in favor of consumptive uses, without regard to the states in which they occur.

Interpretation. If construed by a sympathetic court, one not deliberately seeking a way to preserve navigation, the amendment seems clear on its face. Perhaps this is made easier if the sentence is rearranged to be less cumbersome: "In connection with the operation and maintenance of the works herein authorized for construction, the use for navigation of waters arising in the seventeen western states shall not conflict with the benefi-

cial consumptive use in those states for domestic, municipal, stock water, irrigation, mining or industrial purposes." This states a broad policy for the nation -- the water arising in the west shall be used in the west for beneficial consumptive purposes. It is not limited to protection of western appropriations from the navigation servitude; it eliminates all types of conflict. It is not simply a policy for the Pick-Sloan Plan; "the works herein authorized for construction" were not merely works in the Missouri Basin. The Flood Control Act of 1944 covered the nation from coast to coast -- the Central Valley of California, the Mountain states, the Missouri Basin, the Midwest, the Atlantic Coast states. It does not merely protect current water uses; it talks of any beneficial consumptive use, present or future. It guarantees that the development of the entire west will not be held back to further navigational interests, that future upstream consumptive uses will not have to be foregone because they might cut into or preclude navigational uses.

Legislative History. The best bit of legislative history on the O'Mahoney-Millikin Amendment is found in connection with another piece of legislation, H.R. 3961, the Rivers and Harbors Omnibus Bill, authorizing numerous projects, including improvements to the Missouri River between Sioux City, Iowa and the mouth, consisting of revetments, dikes, closing of minor channels, and dredging to bring the existing 6-foot channel up to a 9-foot standard. Senator E.V. Robertson of Colorado expressed a minority view to the Committee Report on the bill, including, among other objections, that the Senate had not added to the bill the amendment proposed by Senator O'Mahoney, identical to the O'Mahoney-Millikin Amendment to the Flood Control Bill. (S. Rep. 903, 78th Cong., 2nd Sess., 1944, Part II.) Senator Robertson's argument for the amendment is an eloquent explanation of the need of legally assured water supplies for private and federal irrigation enterprises, and the threat to those supplies from the construction of navigation facilities that could "command the water supply." He spoke not only of the threat to present uses, but also to future irrigation, stating, "Future federal reclamation projects cannot be authorized if . . . water supplies are subject to preferential use to maintain navigable capacities." (P. 6.) This demonstrates that the Amendment looked to the future and gave a permanent and continuing preference to the use of water for irrigation projects of the future, a use that might diminish the navigation capacity of today.

Senator Robertson was concerned not only with the problem on the Missouri River. He was also concerned with a navigation project authorized in the Rivers and Harbors Bill on the Snake River in Idaho. Though Senator Robertson's statements were made in reference to another bill, and though he filed a minority report, they are nevertheless extremely pertinent. That bill became the Rivers and Harbors Act of 1945 and, probably because of Senator Robertson's remarks, as passed it also contained the O'Mahoney-Millikin Amendment word for word. So both the bill for the channel and the

bill for the dams are for a single project, and the legislative history of one is relevant to the other.

Senator Robertson's statement does throw one curve. In answering possible objections, he says, "It (the amendment) makes no attempt to allocate waters in any stream as between states." But this must not be taken out of context and given a meaning he did not intend. Congress, he said, ". . . should protect interstate waters for the most beneficial uses. This means an apportionment between conflicting uses . . . . " If the O'Mahoney-Millikin Amendment does not allocate the water between the states, it clearly allocates it between purposes. In the Missouri Basin, the consumptive purposes are generally upstream and navigation is in the lower reach of the river. The allocation to purposes means an allocation of the consumptive use primarily to the upstream states of Montana, Wyoming, and North and South Dakota, superior to the allocation to navigation in Iowa, Nebraska, Kansas, and Missouri. But since consumptive beneficial uses are also made of the tributaries in the Platte Valley of Nebraska and the Kansas River in Kansas, the navigation in the eastern sections of those states is subordinated to the consumptive uses in the western sections. The O'Mahoney-Millikin Amendment thus works both interstate and intrastate.

There might be reason to believe that the O'Mahoney-Millikin Amendment was something less than an allocation of the right to develop future depletions at the expense of navigation, if the Senators thought that there was water enough for both navigation and beneficial consumptive uses. Senator O'Mahoney indicated thirteen years later that perhaps he did think there was enough water for all purposes. As stated above, the Engineering Subcommittee of the ad hoc Missouri Basin States Committee believed the figures of both the Corps of Engineers and the Bureau of Reclamation were wrong, but concluded with the opinion, "that reservoir storage in the Basin can be provided which could effect reasonable regulation between wet and dry periods." (Hearings p. 588.) But it is very clear that the Senate was well informed that the "conflict" they talked so much of could take the form of not enough water for both navigation and consumption. Knowing this, they clearly gave consumptive rights the power to take the water that navigation was using. They made consumption "paramount," "primary" over navigation. Senator Robertson noted that one Corps of Engineers representative said that navigation would require a flow of 30,000 cfs at Yankton (the site of Gavins Point, the first dam above Sioux City), another said 22,000, while Mr. Sloan said for the Bureau that there would be only 17,000. This means, said Senator Robertson,

> . . . that about 1,700,000 acres potentially irrigable under the Sloan Plan would have, in periods of severe drought, a wholly inadequate water supply and, therefore, their irrigation could not be undertaken. All of these figures represent the best

> engineering estimates in good faith. However, they support the fact that there exists a potential conflict between uses of water of the Missouri for navigation and irrigation purposes; and they clearly demonstrate that Congress cannot indulge in conjecture as to the use of water supplies and project operation which may adversely affect dominant interests in a river.
>
> Future Federal reclamation projects cannot be authorized if in given cases water supplies are subject to preferential use to maintain navigable capacities. The law requires that proposed projects be found to have engineering feasibility, a finding that cannot be made unless there is reasonable assurance, legal and physical, of a sufficient water supply. The result of such a situation where improvements authorized by Congress impose a first call on water for navigation, would be to relegate for all time to come large, irrigable areas to the status of desert wastes. (Minority Views, pp. 8, 10.)

This clearly demonstrates that since the Rivers and Harbors bill he was speaking to and the Flood Control Bill both became law, each with the O'Mahoney-Millikin Amendment in it, the amendment was to govern whenever this foreseen conflict came about. The water would go to the irrigation project and the desert would bloom like the rose.

Even after receiving the report of the Engineering Committee, Senator Millikin did not know whether there was water enough for both:

> The Reclamation has a full-scale development program. This bill and the Rivers and Harbors bill represent something beyond any plans that have ever been conceived of before; and, as you develop these plans, true it takes a long time to develop them to their maximum, but as you develop them you are vesting interests which you cannot overturn lightly. As I pointed out the other day, you take navigation here if people are figuring on a 9-foot channel or a 12-foot channel and, assuming, Congressman, that that reflects a conflict of water use -- I don't know whether it will or not; the figures are so conflicting here that I cannot reach a decision. But assume that it would. In the meantime they have built their barges, they have built their docks, they have established their track sidings. They built their wharves, they have built all of the accessories, and would then be claiming to be a vested interest recognized by Congress. Now those are the things that we got to guard against.

He did guard against them; he made sure by his amendment that navigation and its accessory works were not vested interests and that they would not block the future depletion of the water by beneficial consumptive uses upstream.

The governors of some of the upstream states contributed a somewhat ambiguous statement. Governor Moses of North Dakota presented a joint statement for North Dakota, Montana, Wyoming, and Colorado which included the following:

> The right to the use of water for irrigation has been established as the most important use of such water. We are not asking that all the water in the Missouri River and its tributaries shall be earmarked for irrigation. The Bureau of Reclamation proposes the irrigation and reclamation of 4,760,000 acres in the Missouri Valley Basin, in addition to the land now under water. It is an established fact that in addition to this proposed acreage there are more millions of acres suitable for irrigation and that there is ample water to make such additional irrigation possible. However, we are not asking for the unlimited use of water for irrigation. We do not intend to dry up the Missouri River. The Army engineers say that there is sufficient water in the Missouri River and its tributaries to make possible the irrigation of the acreage recommended by the Bureau of Reclamation and to leave ample water for a 9-foot channel below Sioux City, and for domestic purposes in the downstream States.
>
> We are convinced that the amendment referred to, declaring the use for navigation of waters arising west of the ninety-seventh meridian to be subordinate to the beneficial consumptive use of such water for domestic, irrigation, mining, or industrial purposes, is essential to safeguard the future economic stability of the upper basin States. (Hearings, p. 541.)

This seems to indicate that as far as the wishes of these governors are concerned, they do not want to dry up the Missouri River; they think there will be water enough for both, but if there is not, navigation is to be subordinate to beneficial consumptive use. Governor Ford of Montana supplied an additional statement:

> There is very little that I have to say in addition to the facts set forth in the statement just presented by Governor Moses. I would like to emphasize, however, the importance of having written into this law some protection for the upstream States in the use of the water for irrigation purposes, reclamation.
>
> It will be impossible for us to develop reclamation projects, to expend the millions of dollars necessary for such development unless there is written into the law that protection.

> The Commissioner of the Bureau of Reclamation advised the committee when considering the rivers and harbors bill that without some protection or some security he could not justify or could not obtain the approval of projects for reclamation, because one of the essential things in any project is to be able to certify that there is ample water for the project. And the same generally is true when projects are constructed by individuals or by the State.
>
> We think that this amendment which has just been offered affords us this protection.
>
> Since the Army engineers take the position that there is sufficient water for reclamation, for navigation, and for other purposes, we can see no reason why they should object to having that security written into the law . . . .
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> The future of Montana depends to a very large extent upon further reclamation; and I say to you gentlemen in all sincerity that, in my opinion, we cannot get that development unless some security, some protection, is afforded us by legislation. (P. 542-43.)

Perhaps the most complete and precise statement showing that the congressional intent was to permit future projects even though they took water from navigation channels came from an unexpected source, one of the principal opponents of the O'Mahoney-Millikin Amendment. Senator Overton, Chairman of the Committee on Public Works, was exploring the earlier version of the Amendment with the Chief Counsel of the Bureau of Reclamation. The discussion started with consideration of the "coordination section" that required the Secretaries of War and Interior to submit their plans to each other and to the affected states. Under the Reclamation Act of 1939, some projects of the Bureau of Reclamation could be authorized without a special act of Congress, but the coordination clause in the form then under consideration would not allow this if objections were made "on grounds not inconsistent with section (c) of this section." Section (c) was the O'Mahoney-Millikin Amendment in an earlier form:

> Senator Overton. Let us see what paragraph (c) says. It declares:
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> The use for navigation, in connection with the operation and maintenance of such works herein or hereafter authorized for construction, or waters arising west of the ninety-seventh meridian shall be subordinate to and shall not adversely affect at any time the beneficial consumptive use, west of the ninety-seventh meridian, of such waters for domestic, irrigation, mining, or industrial purposes.

What would be the practical application of that?

Mr. Cheadle. If I may illustrate it, it would not have the effect of requiring a subsequent act of Congress if the objection were to the effect that this project proposed by the Secretary of the Interior should not be built because it would take water for beneficial consumptive uses upstream when it is preferred by the objector that the water go downstream where it could be available for navigation purposes.

Senator Overton. That is correct. That seems to be very clear.

Mr. Cheadle. That is my interpretation of that, and I think that is correct, sir.

Senator Overton. I think that is correct; yes. So no objection then could be made that would be available, that the water would be needed for the use of navigation, in the event that it would deprive any affected area of the use of waters for domestic, irrigation, mining, or industrial purposes? I probably should have said "tenable" instead of available.

Mr. Cheadle. I think that is correct, sir. If I may restate it, to make sure that I am agreeing -- consistent with the interpretation I have given it.

Senator Overton. Yes.

Mr. Cheadle. You are saying there would be no objection available for use by an affected down-State interest, if the objection it wanted to make were, "Well, if you build that irrigation project upstream we will not have water which we would like to have for navigation purposes."

Senator Overton. That is right.

Mr. Cheadle. I think that is correct, sir. (Hearings, pp. 744-45.)

In other words, the Secretary of the Interior could, if there was money in the Reclamation Fund, proceed to construct a new irrigation project despite an objection from a state or the Corps of Engineers that the depletion from the project would reduce the navigability of a lower reach of the stream. The automatic authorization under discussion did not survive, possibly due to the Senator's watchfulness. Today, under Sec. 1(c) of the Flood Control Act of 1944, an objection of interference with navi-

gation would send the project to Congress for authorization like an objection on any other grounds, such as environmental harm or encroachment on another state's equitable share of the water. But the automatic authorization did not create the preference; the preference remains; the O'Mahoney-Millikin Amendment creates it and declares that future consumptive use is superior to prevent navigation, as noted by the Senator and Counselor.

That should be clear enough. But subsequent attempts to "clarify the record" have in fact muddied the waters. It has already been noted that in 1957 an attempt was made to show that navigation releases should be subordinated to power production. In 1961 still another document was introduced into the record by Senator Hruska of Nebraska to give the other side of the story. This document is entitled "Missouri Basin Water Rights -- An Analysis of the Legislative History and Interpretation of the O'Mahoney-Millikin Amendment to the Flood Control Act of 1944 and Certain Other Public Laws." (Committee Print, S.Com. on Int. and Ins. Affairs, 87th Cong. 1st Sess.) The document is not itself legal history but a partisan statement prepared for arguing a different proposition than the one here urged. It is a legal brief designed to disprove the proposition that the O'Mahoney-Millikin Amendment granted a priority to hydroelectric power over navigation -- the proposition put forward by the power interests in the 1957 hearings. Certain assertions as to the superior position of navigation must not be taken out of context, but rather with a grain of salt.

In the document mention is made of the predecessor of the O'Mahoney-Millikin Amendment, the House version introduced by Representative Case:

> Provided, that nothing in this Act shall be construed as creating below Sioux City any demand upon the water resources of the Missouri River basin above Sioux City in excess of that now authorized by existing law.

The document then makes an amazing claim about this section. Its argument would turn Representative Case's amendment at least part way around:

> This provision would have guaranteed all of the water needed to maintain navigation below Sioux City as authorized by existing law . . . . The Committee recognized that there existed at that time a legal right, accruing below Sioux City, Iowa, for sufficient water for a navigable channel although it did not spell out how much water had been pre-obligated to that purpose."

This is a complete reversal of the intent. At the most, under "existing law," there was nothing more than a 6-foot channel and no storage but

Fort Peck to sustain it. The flow to sustain navigation of that quality could undoubtedly be maintained under any depletion scenarios examined in this report. What Case actually said in the hearings was,

> I have that concern too, (speaking to Senator Millikin's proposed amendment) and that was why I appeared before the Rivers and Harbors Committee in the House and said that as a very minimum I feel that you should put in this law a provision that nothing in this Act -- referring to the Act that was proposed to be established with 9-foot channel -- nothing in the Act should be construed as creating below Sioux City any right above those now authorized by law. In other words, that that project should not create any vested, any additional interest, any rights down there (indicating on map) that did not now exist. I said that is the minimum, and I would like to go further than that and I would like to reclaim for this country in here (indicating) any rights that we should have, if that could be done. (Hearings, p. 605.)

This "Analysis of the Legislative History" makes one further statement:

> After receiving engineering assurances that there would be sufficient water for the recognized economic requirements, both upstream and downstream, all representatives in the Missouri Valley and along the Mississippi River downstream to Louisiana were urged to consent without delay to the O'Mahoney-Millikin amendment and to pass the legislation.

The lawyers who make this statement cite no public record to support it. It is not believed there is one.

At Least a Policy, a Rule of Law

It might be that the O'Mahoney-Millikin Amendment fails to meet the tests for a congressional apportionment. One difficulty with the theory that it accomplished a congressional allocation is the lack of permanence of the division. The allocation in the Boulder Canyon Project Act was implemented by California's passage of the Self-Limitation Act and the Secretary of the Interior's contracts with Arizona and Nevada. California's acceptance of the congressional proposal, and the permanent service provisions of the Secretary's contracts, created vested contractual rights, irrevocable by either party, true allocations of water rights in perpetuity. The O'Mahoney-Millikin Amendment could be unilaterally repealed by Congress at any time. It does not purport to bind future congresses.

The Amendment is not like the apportionments of the Colorado River in other ways. It distributes no water stored by the United States. It makes

no grant of specific amounts. It formulates no division among states. Nor is it an example of a partial congressional allocation. It calls for no project that requires a specific quantity of water at the site that can be said to guarantee that the state's share includes that amount.

The O'Mahoney-Millikin Amendment may not be literally a congressional apportionment of the waters of an interstate river. Nevertheless there is no doubt that it is a congressional directive that is dispositive of the principal issues that are involved in any attempt to divide the river. In no proceeding in court could "an equitable apportionment" go counter to it.

The O'Mahoney-Millikin Amendment is more than a policy statement. It is a rule of substantive law. It shares with a congressional allocation one cardinal feature: as long as it stands, no court will "substitute its own notions of 'equitable apportionment' for the (rule) chosen by Congress." That rule is clear. Waters arising in the west are reserved for use in the west.

O'Mahoney-Millikin and Hydroelectric Power

The O'Mahoney-Millikin Amendment would also seem to lay to rest the argument that downstream states may have some ground of complaint against upstream depletion that reduces power production from the main stem dams. The amendment does not mention power in its contrast between navigation and beneficial consumptive uses, but when analyzed, it is clear that power is a concomitant of navigation and that the subordination of navigation also subordinates power.

It must be noticed that the word "power" does not occur in the amendment, which juxtaposes navigation with beneficial consumptive uses and subdivides these into domestic, municipal, stock water, irrigation, mining, or industrial purposes. The obvious intent is to contrast consumption versus nonconsumption and to protect the former. The cardinal rule of statutory construction is to "look at the mischief to be corrected" and give the statute a meaning that will accomplish that objective. Senators O'Mahoney of Wyoming and Milliken of Colorado were trying to preserve the traditional western sanctity of appropriations for beneficial use. It could not have been their intent that these were to be protected from impairment by navigation, yet be foregone in favor of hydroelectric power.

Evidence that power took a back seat in the minds of the framers of the Act can be found in some of the documents supporting and authorizing the Pick-Sloan Plan. The Pick Plan (House Doc. 475) was addressed almost entirely to flood control, and mentioned power only incidentally in summing up the economic justification for projects:

> In addition to providing flood control benefits on the Missouri and Mississippi Rivers, the comprehensive plans would

> also provide for the most efficient utilization of the waters of the Missouri River Basin for all purposes, including irrigation, navigation, power, domestic and sanitary purposes, wildlife and recreation."

It said nothing about the priority of these uses. However, in the Bureau of Reclamation's comments to the Pick Plan (made while the Sloan study was still in progress) the Commissioner of Reclamation stated,

> In planning the control and utilization of the waters of the Missouri Basin, the widest range of multiple benefits should be sought in each feature or group of features. All reservoirs included in the comprehensive plan, including Fort Peck, should be operated to obtain the maximum benefits in common for flood control, navigation, irrigation, power generation, and other water-conservation activities, including, but not limited to, utilization for fish and wildlife preservation, recreation, pollution abatement, maintenance of surface and ground water levels, silt control, and domestic and industrial purposes. To the extent, however, that several functions of water control and utilization are conflicting, preference should be given to functions which contribute most significantly to the welfare and livelihood of the largest number of people. It is, for example, the view of the Bureau of Reclamation, that the waters of the Missouri River and its tributaries west of or entering above Sioux City are more useful to more people if utilized for domestic, agricultural, and industrial purposes than for navigation-improvement purposes. To the extent that these uses are competitive, domestic, agricultural, and industrial uses should have preference. (House Doc. 475, p. 7.)

In the Sloan Plan, Sen. Doc. 191, the Bureau said,

> Most of the power plants proposed in the plan for developing water resources of the Missouri River Basin will generate electrical energy for use in pumping for irrigation, and for domestic, commercial and industrial uses. A few will be used exclusively for irrigation purposes. In most cases, the operation of the power plants will be governed by the storing and releasing of water for purposes other than power generation, such as flood control, irrigation, navigation, and miscellaneous uses. The capacities and arrangement of the power plants have been planned accordingly.

The "Pick-Sloan Plan," Sen. Doc. 247, was the report of a committee of two engineers from the Corps and two from the Bureau, ironing out the differences between the two plans. In a joint statement the Commissioner

of Reclamation and the Chief of Engineers said, "It was possible to bring into agreement the plans of the Corps of Engineers and the Bureau of Reclamation by recognizing the following basic principles: . . . (c) Both agencies recognize the importance of the fullest development of the potential hydroelectric power in the Basin consistent with the other beneficial uses of water." "Consistent with" means compatible with, not in derogation of, not interfering with, not infringing upon. It is obvious that no argument can be made that future upstream consumptive projects should be foregone because downstream power production would be reduced.

This continues to be the administrative interpretation, as shown by the discussion of the Corps of Engineers' "Master Manual" for reservoir regulation in Chapter II.

The O'Mahoney-Millikin Amendment itself, carefully analyzed, shows that "the use of water for navigation" includes the use for hydroelectric power generation of water stored pursuant to the navigation power. The production of hydroelectric energy is not a function directly granted to the United States. The express power given to Congress by the Constitution is to regulate commerce among the several states. The regulation of commerce involves the improvement of navigable waters over which commerce may travel, and this may be accomplished by augmenting the flow of navigable waters and also by protecting the waters and navigational facilities from damage by floods. These powers lead in turn to the power to build the dams needed for these purposes, and finally, the dams having been built and the water stored, to the power to create electricity.

> The power of falling water was an inevitable incident of the construction of the dam . . . . The mechanical energy was converted into electrical energy, and the water power, the right to convert it into electrical energy and the electric energy thus produced, constitute property belonging to the United States. (Ashwander v. Tennessee Valley Authority, 297 U.S. 288, 1936.)

This pyramid of powers is a firm structure, and it points to the inescapable conclusion that the production of electric energy is a part of and included in the regulation of the water and the operation of the structures for navigation. Where the Amendment says "the use for navigation," it therefore refers to "the use of water under the power to regulate navigation," and places the power produced as an incident to that use on the bottom rung of the preference ladder.

Mention has already been made of a rather curious development, the 1957 attempt to get Congress to recognize power production as an industrial use, one of the beneficial consumptive uses that takes precedence over navigation. At that time, Montana favored this position, seeking along

with other upstream states to receive greater power benefits from the then-incomplete Sloan Plan. Today that proposition would work very much to the disadvantage of the Upper Basin. If power is a beneficial use to which navigation is subordinate, there is nothing to indicate where its position would be in relation to other beneficial uses. Although some states have established a hierarchy of uses, preferring domestic to other uses and sometimes placing power on the bottom rung, in the absence of such a ranking, all uses are equal. In any case, there are no state water rights for power production at the dams and there is nothing to indicate a federal preference list. Presumably all beneficial consumptive uses would then be on a par and, if so, priority would prevail. Should federal power production be elevated to the status of an appropriation, every upstream depletion initiated since the dam's construction and forever in the future might be regarded as an infringement of priority.

Fortunately, this proposition is completely without merit. It cannot stand in the light of the analysis that power is an incident to navigation operations. Neither can it stand on its own feet.

Senator O'Mahoney, in support of the rural electrification program, tried to tie power to the other uses by saying, "The water could be used to produce electric energy for domestic purposes, for mining purposes, for industrial purposes." Senator Hruska of Nebraska, trying to pin him down, asked why there was no specific reference to hydrogeneration in the O'Mahoney-Millikin Amendment. Senator O'Mahoney replied that the only danger feared at the time was from navigation uses. He said, "I can assure the Senator there was no reason for excluding it. If we had ever thought that industrial purposes would not include the furnishing of power for industrial objectives, if we thought there was any such interpretation at all, it certainly would have been mentioned. I think it is implicit here." (Missouri Basin Water Problems, Joint Hearings before the Committees on Interior and Insular Affairs and on Public Works, 1957, page 73.) Senator Hruska then asked if the use of water for power generation was a consumptive use, and Senator O'Mahoney replied that "in the process of going through the structures, there is evaporation." (Page 76.) The whole exchange demonstrates that hydroelectric power production was forgotten when the Amendment was drafted, certainly not intended to be preferred, despite what Senator O'Mahoney said thirteen years later when trying to help his friends in favor of rural electrification.

An electric power cooperative submitted a legal opinion to the effect that the use of water for power generation is an industrial use entitled to preference. (Pages 113-117.) Some time later, Senator Hruska refuted this by inserting into the record a very elaborate legal brief giving the opposite view. (Missouri Basin Water Rights, Committee Print, Senate Committe on Interior and Insular Affairs, 1961.) Nothing ever came of either document; no action was ever taken by Congress. The matter was

dropped. Having taken so firm a position that power is not a beneficial consumptive use, it would seem that the lower basin states would now find it hard to gain any benefit from asserting that it is one.

INTERSTATE COMPACTS

Introduction

The law of interstate compacts can be very complex. A great deal of law exists, for example, on the type of agreement that constitutes a compact and the subjects that do not need a formal compact. For an understanding of Montana's relations with the other states of the Missouri Basin, however, all of the law's ramifications need not be explored, and the description can be kept fairly simple. Since this report is to be functional, it must relate to the possibilities of compacts in the Missouri Basin and cannot be an abstract dissertation.

When the occasion for compacting does arise, more complex questions will need answers and more specific research will be needed. There is much legal writing concerned with interstate compacts, but three major works stand out. The historic origins and growth of the compact were thoroughly explored in 1925 by one of the great law review articles, Frankfurter and Landis, The Compact Clause of the Constitution (14 Yale L.J. 691, 1925). These men were at that time professors of law at Harvard and Yale, respectively, and they saw an emerging regionalism as a political reality of the times and the interstate compact as a form of political adjustment that offered great promise for solving 20th century problems of less than national but greater than state importance. Twenty-five years later the Council of State Governments commissioned and published a followup work, The Interstate Compact Since 1925 (Zimmerman and Wendell, 1951). This emphasized the many forms that compacts had taken and explored very thoroughly the possibilities of the compact as a "third level of government" intermediate between the states and the nation. The most recent work, the one most directly concerned with water allocation compacts, is Muys, Interstate Water Compacts: The Interstate Compact and Federal-Interstate Compact (National Water Commission, 1971, Legal Study 14, National Technical Information Service, P.B. 202, 998). An invaluable collection of texts and legal histories is Witmer, Documents on the Use and Control of the Waters of Interstate and International Streams (House Doc. No. 319, 90th Cong. 2d Sess., 1968).

Types of Compacts

Compacts between the states actually predate the union. The English colonies in America settled border disputes and made other agreements with the approval of the Crown, and under the Articles of Confederation the

Continental Congress was substituted for the monarchy. This explains the negative form of the Compact Clause in the Constitution of 1787, which only authorizes compacts by indirection: "No state shall, without the consent of Congress, . . . enter into any agreement or compact with another state . . . . " (Art. I, Sec. 10.)

Border settlements and navigation improvements were the principal forms of compact up through the 19th century. In this century they grew in scope to cover such subjects as higher education, crime and criminals, oil and gas regulation, fighting forest fires, managing interstate parks, and establishing multi-state metropolitan districts. Some compacts are advisory, some establish joint commissions, some are managed by a cooperative administration, some are merely planning organizations. Water was an important subject from the beginning, and the various aspects of water covered by compacts have included navigation improvement, fishing rights, boundary waters, cooperative flood control, water pollution, and water allocation. The water allocation compacts have been subdivided again: some administer shortages, some allocate surpluses, and some create commissions to plan and regulate the use and control of interstate streams.

Water Distribution Compacts

Several western compacts have been negotiated as solutions to the problems created by the overappropriation of an interstate stream, as each state proceeded with development in ignorance or disregard of the state of development in upstream or downstream states. The first of these was the La Plata River Compact, (1925). The La Plata flows from Colorado into New Mexico, and the compact gives each state unrestricted use when the flow is 100 cfs or more; lower flows are split in half and extremely small flows are rotated between the states, each taking the whole stream for a short period. The South Platte Compact of 1926 divides the river between Colorado and Nebraska in much the same manner. It allocated to each state a block of the average virgin flow of each tributary and reach of the river. It also ratified the rights of one interstate canal and approved the construction of another. The 1938 Rio Grande Compact contains extremely complicated engineering criteria for the delivery of water and operation of reservoirs in Colorado, New Mexico, and Texas. Undoubtedly the most complex example of this type is the Bear River Compact of 1955. The Bear wanders in and out of Idaho, Wyoming, and Utah and the Compact divides the river into three divisions, several sections and a number of tributaries, each with its own apportionment.

These are essentially settlements of potential lawsuits of the Wyoming v. Colorado type. They provide mechanisms for apportioning overappropriated water according to priority or to agreed modifications of priority, adjusted, perhaps, to reflect the relative expectation of each state of winning the lawsuit or its desire to avoid the expense and uncer-

tainty of suit. The Arkansas River Compact of 1948 finally resolved the differences between those ancient enemies, Colorado and Kansas. It not only settles existing disputes and causes of controversy but also divides between the two states the future benefits of a large new project situated in Colorado.

Water Allocation Compacts

The original hopes for a Colorado River Compact had been for an agreement to allocate shares of unappropriated water to the states of the Colorado River Basin. The river naturally divides itself between the upper basin in the high altitude valleys and the lower basin between California and Arizona, separated by many miles of spectacular canyons. Each of the seven states had made extravagant claims on the river, and negotiations failed to provide an acceptable formula for splitting the water among them. Herbert Hoover was then Secretary of Commerce and, at the request of the President, acted as a federal representative at the negotiations. He suggested that what was thought to be the dependable flow of the river at least might be divided between the upper and lower basins, giving approximately half to Wyoming, Colorado, Utah, and New Mexico, subject to the obligation to deliver a like amount to California, Arizona, and Nevada. The Compact left unsolved the problem of allocating these shares among the states of the basins, but this arrangement did guarantee the upper states a fund of water immune from priorities below. This allayed the main fear that had led to the negotiations -- that the people in the upper basin would be foreclosed by the foreseeably earlier development of the lower basin, particularly in California. Arizona, whose dream of a Central Arizona Project received no such protection against California's priorities, refused to ratify the Compact until 1944, when she finally saw advantages to relying on the Compact rather than fighting it.

The first really successful compact for sharing unappropriated water was the Republican River Compact of 1942, which allocated specific blocks of water to each state, subdivided into flows of many sub-basins, and quantified in acre-feet of beneficial consumptive use.

The archetype of the compact for allocating a surplus of water is the Upper Colorado Compact of 1948. The background of this Compact is briefly described above in this chapter's section on Congressional Allocation. The states of the upper basin agreed to divide the total quantity available for use each year in the upper basin under the Colorado River Compact, apportioning 51.75% to Colorado, 11.25% to New Mexico, 23% to Utah, and 14% to Wyoming. Montana's Yellowstone River Compact (1950) with Wyoming and North Dakota is a good example of this type. It deals basically with dividing the waters of the major tributaries (Clarks Fork, Big Horn, Tongue, and Powder), applying to all the following rules: (1) existing rights as of January 1, 1950 are maintained as the status quo; (2) no water

may be diverted from the Yellowstone River Basin without consent of all states; (3) existing and future domestic and stock water uses and reservoirs up to 20 acre-feet are exempted; and (4) the unappropriated flow of each tributary, after needs for supplemental supply for existing rights are met, is allocated to Montana and Wyoming on a percentage basis.

Legal Requirements

Consent in Advance

The Constitution requires only that Congress consent to the agreement, and it is possible for a compact to be negotiated without any form of advance federal approval and then be submitted to Congress. The general pattern for interstate water compacts, however, was set by the procedure adopted in 1921 for the negotiation of the Colorado River Compact. Congress gave consent to the seven states of the basin to negotiate a compact or agreement not later than January 1, 1923, providing an equitable division and apportionment among said states of the water supply of the Colorado River. Provision was made for appointment by the President of a representative of the United States to protect the federal interests. The act provided that the Compact so negotiated should not become effective "unless and until the same shall have been approved by the legislature of each of said states and by the Congress of the United States." (42 Stat. 171, 1921.)

There is occasional variation of this pattern. It is possible for Congress to give advance consent to whatever compact is eventually agreed upon. This is rare, although some have been approved in other areas. In the water resources field the only example is the consent given in the Boulder Canyon Project Act of 1928 to a compact dividing the waters of the lower basin, and there the specific terms of the compact (which was never consummated) were dictated by Congress. (45 Stat. 1057, 1059, 1928.)

Consent in advance legislation is usually initiated at the request of the congressional delegation of the negotiating states, but it can be part of legislation authorizing a federal project that would be facilitated by such a compact. Section 19 of the Boulder Canyon Project Act (45 Stat. 1057, 1065, 1928) gave Congress's consent to the seven states of the basin to "negotiate and enter into compacts or agreements supplemental to and in conformity with the Colorado River Compact." Almost twenty years later no new congressional consent was sought for the Upper Colorado River Basin Compact.

Consent to negotiate is usually freely given, since any resulting compact will not be effective unless later approved by Congress. Although not constitutionally required, this practice is a positive exercise of congressional consent authority, and Congress sometimes uses it to guide

the states by specifying conditions for its ultimate consent. The requirement of federal participation in negotiations is almost universal, and Congress has often added guidelines deemed appropriate to facilitate negotiations or mark out a federal area on which the states are not to trespass. An example of this is the consent legislation for the Yellowstone River Compact, which carried the proviso that, "Nothing in this act shall apply to any waters within or tributary to the Yellowstone National Park or shall establish any right or interest in or to any lands within the boundaries thereof." (63 Stat. 152, 1949.)

Federal Representation

The first federal participation in negotiations was in connection with the Colorado River Compact. The federal representative was the Secretary of Commerce, but no representative of Cabinet rank has since been appointed. Sometimes Congress has specified that the representative shall be from the Department of the Interior (e.g., Bear River Compact, 60 Stat. 658, 1946). Secretary Hoover took an active part in the Colorado negotiations, suggesting the compromise that formed the basis for the ultimate contract, but others have been less effective. Muys' study for the National Water Commission indicates some of the problems faced because of lack of agreement within the executive department of the government. (Pp. 261-67.) A memorandum prepared by the old Bureau of the Budget, entitled "Guide to Federal Participation in Interstate Compact Negotiations," has been provided to all compact negotiators since 1952. It specifies the role of the federal representative as follows:

> The federal representative has the duty of assuring that the complete range of federal or national interests is considered in compact commission discussions and actions. As the President's representative on the Commission, he should avoid identifying with any agency, program, local faction, or sectional interest. The federal representative should maintain a completely neutral position in all matters of purely state concern.

The guide requires the federal representative to coordinate with all interested federal agencies and to submit quarterly status reports, copies of minutes and drafts, and legal problems encountered.

It is interesting to note that in the negotiation of the federal-interstate compact on the Delaware, federal representation was deliberately excluded. Although federal interests would be most significantly affected by the compact, and the federal government would become a party to it, the state negotiators were convinced that the executive branch would likely oppose the concept of a federal-interstate compact and would engage in dilatory tactics which might be fatal to the states' objectives. The

Compact had good support from the states' congressional delegations and the legislation approving the completed compact stated that, "The United States hereby consents to, and joins . . . in the . . . compact," with a number of reservations that placated executive objectors.

Final Consent

Although many compacts contain clauses disclaiming any intent to alter or affect the rights and powers of the United States in relation to the water under consideration, legislation granting congressional consent to the negotiated compact often attaches similar conditions. (Arkansas River Compact 1948, Art. IX, P.L. 82, 81st Cong., Sec. 2, 1949.) The necessity for these provisions in either form is doubtful. It seems clear that if the United States is not a signatory party to the compact, its rights can in no way be affected by agreement between states. Congress has on occasions added very elaborate reservations that seemingly are inconsistent with the provisions of the compact or, at the very least, limit the effect of compact provisions that on their face seem much broader. See the consent legislation to the Delaware River Basin Compact (75 Stat. 688, 1961) and the Republican River Compact (57 Stat. 86, 1943).

Legislation consenting to an interstate compact takes the form of an ordinary act of Congress, and is subject to Presidential veto like any other act. The first bill granting consent of Congress to the Republican River Compact was vetoed by President Roosevelt because it declared the Republican River to be nonnavigable and designated all consumptive uses of water as paramount to nonconsumptive power uses. In his veto message, the President indicated that he would approve a bill that specifically reserved to the United States all of the rights and responsibilities which it now has in the use and control of the waters, and this was incorporated in the final approval. (57 Stat. 86, 1943.)

Effect on State Law

The terms of an interstate compact will have an effect on the use and conditions of use of water within the boundaries of the compacting states, at least within an upper state. Many compacts have a clause dealing with this, such as the one in the Arkansas River Compact: "Nothing in this compact shall be deemed . . . to interfere with or impair the right or power of either signatory state to regulate within its borders the appropriation, use and control of water within that state not inconsistent with its obligations under this compact." Many compacts omit any mention of the subject, but the result is probably the same.

In Hinderlider v. La Plata River and Cherry Creek Ditch Co. (304 U.S. 92, 1938), the Compact provided for rotation of low flows between Colorado and New Mexico. During a period when New Mexico was entitled to

the water, a senior Colorado appropriator was not allowed to take any. It sued the state engineer, alleging a deprivation of its rights under the laws of Colorado, adjudicated in the Colorado courts long before the making of the compact. On appeal to the Supreme Court of the United States, that Court said,

> Whether the apportionment of the water of an interstate stream be made by compact between the upper and lower states with the consent of Congress or by a decree of this Court, the apportionment is binding upon the citizens of each state and all water claimants, even where the state had granted the water rights before it entered into the compact . . . . As the state had power to bind by compact their respective appropriators by division of the flow of the stream, they had power to reach that end either by providing for a continuous equal division of the water from time to time in the stream, or by providing for alternate periods of flow to the one state and to the other of all the water in the stream . . . . As Colorado possessed the right only to an equitable share of the water in the stream, the decree . . . did not award to the Ditch Co. any right greater than the equitable share . . . .

In this light, the compact is a superior law to the state laws. Although the usual rationale of the Hinderlider case is that the ditch company had rights only to Colorado's share and Colorado's share had been exhausted, in a very real sense the compact limited the effect of Colorado's laws that but for the compact would have passed the water to the ditch company. This superiority of compact over state law is operative even if the state law takes the form of its constitution. Dyer v. Sims (341 U.S. 22, 1951) involved the Ohio River Valley Water Sanitation Compact of 1948. The West Virginia legislature appropriated $12,250 to meet the state's share of the compact expense. The state auditor refused to honor the warrant on the ground that the compact created a type of debt forbidden by the state constitution. The West Virginia Supreme Court agreed on this point and also ruled that the compact was an illegal delegation of West Virgina's police power to other states. The Supreme Court of the United States reversed, holding that there was nothing in the state constitution "to indicate that West Virginia may not solve a problem such as the control of river pollution by compact and by the delegation, if such it be, necessary to effectuate such solution by compact." The Court also found with respect to the debt that the compact had been drawn with great care to meet the problem of debt limitation and that the obligation of the state under the compact was not in conflict therewith. This ruling is an apparent violation of the precept that the Supreme Court should leave matters of interpretation of state law and state constitutions to the state courts, but in this case the Court said,

> Just as this Court has power to settle disputes between states where there is no compact, it must have final power to pass upon the meaning and validity of compacts . . . . A state cannot be its own ultimate judge in a controversy with a sister state . . . . Of course every deference will be shown to what the highest court of the state deems to be the law and policy of its state . . . Deference is one thing; submission to a state's own determination of whether it has undertaken an obligation, what that obligation is, and whether it conflicts with a disability of the state to undertake it is quite another.

It must not be thought that the compact, because of its ratification by Congress, becomes a federal law. The contrary has been specifically ruled in the Hinderlider case above, and in Delaware River Commission v. Colburn (310 U.S. 419, 1939). It is not the Supremacy Clause that makes the compact superior, it is the Compact Clause.

When a state legislature ratifies a compact with a provision that is inconsistent with existing state laws, it modifies those laws. However, the compact is more than a mere amendment. A compact may modify a law in a way that an ordinary statute could not. It is obvious that Colorado could not pass an ordinary statute that cut back the La Plata and Cherry Creek Ditch Company's right or subordinated it in priority. Furthermore, unlike a statute, a compact cannot be repealed by repealing the ratifying law. Nor can this be done by implication, as by a state enacting an inconsistent law subsequent to the compact. In the old case of Green v. Biddle (8 Wheat. U.S. 1, 1823), Chief Justice Marshall struck down a state statute because it was in conflict with a compact, but he did not even mention the compact clause as a basis for his holding. Instead, he considered the compact to be a contract between states, and so within the constitutional prohibition against impairment of the obligation of contracts. The compact clause of the Constitution would seem an alternate ground.

Effect on Federal Law

Most water resource compacts contain a provision that the compact is to have no effect on federal "rights," "jurisdiction," or "powers." (See Art. XIII, Arkansas River Compact, 1965; Art. X, Republican River Compact, 1942.) Where the compact is silent, Congress often had such a limitation in the consent legislation. (See Arkansas River Compact, 1948, 63 Stat. 145, 1948.) These provisions, in both forms, are probably made out of an abundance of caution to remove any possibility of argument, since the Congress by its consent does not become a party to the compact or agree to be bound by it. But in at least some cases Congress has agreed to at least a partial relinquishment of certain specified powers. Both the final Republican River Compact and the Belle Fourche Compact state that they shall become operative only when consented to by Congress by legislation

which provides that the United States shall recognize, to the extent consistent with the best utilization of the water for multiple purposes, that beneficial consumptive use of the waters within the basin is of paramount importance to the development of the basin, and that the United States will recognize any valid established uses for domestic and irrigation purposes which might be impaired by the exercise of federal jurisdiction over the waters of the river. In the consent legislation Congress embodied these provisions verbatim, thus in effect making the United States a party to the agreements. (57 Stat. 86, 1944; 58 Stat. 94, 1944.) On the other hand, in some compacts the document has severely limited or altered federal powers, at least by its terms. One such agreement set up the Delaware River Basin Commission, negotiated without federal participation. Congress appended to its consent several pages of reservations construing or limiting several of the compact clauses, and in some instances substituting contrary provisions. (75 Stat. 688, Part II, 1961.)

Duration -- Termination

No state party to a compact may revoke it or withdraw from it during its lifetime. Most water allocation compacts assume that they will remain in force indefinitely, some provide for termination by mutual consent, some specify the method (e.g., state legislation) by which the termination can be accomplished.

Termination by withdrawal of congressional consent is another matter. The Supreme Court has never directly ruled on the question, but it refused to review the Court of Appeals case in which the question came up. (Tobin v. United States, 306 F.2d 270, D.C. Cir. 1962, cert. den. 371 U.S. 902, 1962.) In that case it was argued that once Congress gave its consent to a compact it became irrevocable. However, the court recognized that Congress had an implied power to condition its consent by reserving the right to alter, amend, or repeal the consent legislation. It is probably also true that Congress possesses the inherent right to revoke or amend its consent or enact an inconsistent law even in the absence of a specific reservation in the original consent. (See Louisville Bridge Co. v. United States, 242 U.S. 409, 1917.)

Indian Water Rights

The Colorado River Compact of 1922 set the pattern for the treatment of Indian water rights in interstate compacts. Essentially, they are shoved under the rug, left for future determination. Art. VII of the Colorado Compact states, "Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes." There have been variations on this theme. The Yellowstone Compact contains the following in Art. VI: "Nothing contained in this compact shall be so construed or interpreted as to affect adversely any

which provides that the United States shall recognize, to the extent consistent with the best utilization of the water for multiple purposes, that beneficial consumptive use of the waters within the basin is of paramount importance to the development of the basin, and that the United States will recognize any valid established uses for domestic and irrigation purposes which might be impaired by the exercise of federal jurisdiction over the waters of the river. In the consent legislation Congress embodied these provisions verbatim, thus in effect making the United States a party to the agreements. (57 Stat. 86, 1944; 58 Stat. 94, 1944.) On the other hand, in some compacts the document has severely limited or altered federal powers, at least by its terms. One such agreement set up the Delaware River Basin Commission, negotiated without federal participation. Congress appended to its consent several pages of reservations construing or limiting several of the compact clauses, and in some instances substituting contrary provisions. (75 Stat. 688, Part II, 1961.)

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rights to the use of the waters of Yellowstone River or its tributaries owned by or for Indians, Indian tribes, and their reservations." The Upper Colorado River Basin Compact, in Art. VII, adds another thought: "The consumptive use of water by the United States of America or any of its agencies, instrumentalities or wards shall be charged as a use by the state in which the use is made; provided, that such consumptive use incident to the diversion, impounding or conveyance of water in one state for use in another shall be charged to such latter state." This is probably the law in the absence of such a provision. Section II(D) of the Arizona v. Colorado decree (376 U.S. 340, 1964), after listing the Indian reservations, national recreation areas, and wildlife refuges entitled to federal reserved rights, provided further "that consumptive uses from the mainstream for the benefit of the above-named federal establishments shall . . . be satisfied only out of water available . . . to each state wherein such uses occur . . . . "

Where unappropriated waters are unavailable these provisions carry out the doctrine of Winters v. United States (207 U.S. 564, 1908), which gives all Indian uses, no matter when initiated, priorities as of the date of the founding of the reservation. In most cases these will be a first call upon the unappropriated water allocated to the state and reduce the amount of that allocation available for off-reservation uses. Where the waters are overappropriated or overclaimed, lack of quantification of Indian rights may create such uncertainties that the states will be unable to agree upon a division of the waters, or the federal government, if it believes the rights of the Indians are jeopardized, may withhold consent. Muys relates the California-Nevada experience in which the states agreed to an allocation of the Truckee River after ten years of negotiations, only to have the federal government change its position on the Paiute Indian claims to water for Pyramid Lake and withhold consent until that matter was settled. It is in litigation to this day. (Pp. 267-278.)

Contents

Interstate compacts are negotiated documents, tailored to particular localities, needed at different times, designed to solve a wide variety of problems. Each is a unique document, and even the similarities are no more than that. Clauses to accomplish the same purpose differ from compact to compact. None will serve as a model for a Missouri Basin Compact, because none was designed for Missouri problems.

Something of a catalogue of clauses can be found in Muys (pp. 7-20), who classifies the content of compacts under the following headings:

Purposes. Most compacts recite the need for an equitable apportionment, and contain general statements of subsidiary objectives. Some merely describe the compact; some contain aids for or limitations on interpretation.

Kinds of Apportionments. Several different formulae for division are noted: specified quantities allocated in acre-feet per annum of beneficial consumptive use, apportionment of stream flow measured in fixed percentages, limitations on storage permitted in reservoirs, and various combinations and variations of these themes. In addition, existing uses and rights are usually protected and about half the compacts provide that the allocations will include federal uses.

Implementation and Administration. All of the recent compacts provide for a permanent administrative entity to carry out the various functions essential for achieving the compact's objectives. The compacts detail the membership of the commissions, the voting provisions, and the funding of the commission's operations.

Powers. The functions of the adminstrative commissions implementing the compact allocations are spelled out in many different ways. The principal functions are extensive data gathering and surveillance. Few commissions possess any broader authority. Every commission can adopt appropriate bylaws, employ necessary personnel, etc.

Duration. None of the compacts specify a termination date. Some recite they are to remain in effect until modified or terminated by unanimous action, a truism that would occur absent any express provision to the contrary.

A very useful source is Witmer, the compilation of all water compacts up to 1968. There are now many precedents to use as guides; many clauses in each compact that can be modified for future use elsewhere. These can hardly be selected in advance of knowing the problem. A few generalities have come to be something like "boilerplate," such as provisions in regard to Indian water rights, the effect on state laws, the effect on federal laws, etc. Many of these may not really change the substantive law; they may be superfluous because the same thing would probably happen in their absence. They may serve some purpose, however, they may avoid surprises and they may provide procedures in foreseeable cases of dispute.

Federal-Interstate Compacts

The idea of a federal-interstate compact for the Missouri Basin was first presented thirty years ago by the three dissenting members of the Missouri Basin Survey Commission, an eleven-man, bipartisan, temporary agency appointed by President Truman in 1952. Several members, including Senator James E. Murray of Montana, were admirers of the Tennesse Valley Authority, and originally favored a similar organization for the Missouri Basin. Eventually, the Survey Commission's majority recommended a new form of coordinating agency to plan and direct within the basin the activities of the traditional federal agencies for land and water development.

It was to be much more than a river basin commission as later constituted, but much less than a valley authority with corporate form that would itself perform the major functions of project construction and operation. The proposed organization would have been a five-man independent agency, its members appointed by the President, with broad powers over the Corps of Engineers, the Department of the Interior, the Department of Agriculture, and others. This body was to have combined the agency plans into a master plan, reviewed requests for authorizations before transmission to Congress, prepared a basin-wide multi-agency budget for Congress, and provided central control of river operations. The dissenting Commissioners believed that the coordinating agency should be established by a federal-interstate compact rather than by Congress, and that it should be composed of one member from each state and one from the federal government. (Missouri: Land and Water, Report of the Missouri Basin Survey Commission, 1953, pp. 8-14.) A tentative draft of a compact was prepared by representatives of several states, and the legal ramifications were explored. (See Trelease, A Federal-State Compact for Missouri Basin Development, 7 Wyoming L.J. 161, 1953.) With the election of President Eisenhower, however, the national movement for more TVAs collapsed. The Valley Authority had been seen by the states as a real threat to their water laws and irrigation institutions, and with its elimination, the federal-state compact movement also collapsed.

The idea was renewed in the late 1950s by the eastern states of the Delaware River Basin. Those states already had INCODEL, the Interstate Commission on the Delaware River Basin, created not by compact but by the enactment of identical and reciprocal legislation by Pennsylvania, New Jersey, and New York. INCODEL's primary emphasis was on water quality control, but it had some authority for general planning of water development. Experience showed the desirability of this cooperative approach and the need for its expansion, and the Delaware River Basin compact was negotiated and ratified by the states, and Congress both consented to and joined in the compact in 1961.

The compact set up the Delaware River Basin Commission, consisting of the Governors of New York, Pennsylvania, New Jersey and Delaware, or their alternates, and one federal commissioner. Its major function is to prepare a comprehensive plan for development of the basin, including all public and private projects and facilities, followed up by an ongoing six-year program of implementation, annually revised. The Commission licenses each project to be undertaken, and can itself construct and operate projects. It even has the ". . . power from time to time as need appears, in accordance with the doctrine of equitable apportionment, to allocate the waters of the basin to and among the states signatory to this compact and to and among their respective political subdivisions, and to impose conditions, obligations and release requirements related thereto." (Sec. 3.3.) The Commission can also regulate withdrawals of surface and

ground waters in areas of shortage and cases of emergency. (Secs. 10.4, 10.5.) It exercised these powers during an extended drought that reached the emergency stage in 1965, curtailing New York City's withdrawals and ordering reservoir releases to prevent salt water intrusion upriver into Philadelphia's water intakes. (Muys, pp. 117-192, gives a full case history of the negotiations for and operations under the Delaware River Basin Compact.)

There are few legal problems connected with the federal-interstate compact, and none of them are insuperable. The power of the United States to enter into permanent agreements with the states, ceding to them federal works and powers, was first recognized in Seawright v. Stokes (3 How. U.S. 149, 1845). The major problem on the Delaware was the relationship of the Commission's comprehensive plan to the federal government's programs. Conflicts with the power over navigation were seen as difficult, and were avoided by leaving that subject outside the scope of the Commission's activities. The compact provides that as to all projects, including federal projects, no expenditures or construction shall be made if the project is not included in the plan. The federal government has only one vote on the five-member commission, so that as the compact is written, the commission could veto a federal project by a vote of the states. This was unacceptable to the federal government, so in the consent legislation a reservation recites that while nothing in the compact shall impair the constitutional authority of the United States or any of its rights or authority under existing or future legislation, the exercise of those federal powers shall not substantially conflict with a commission plan concurred in by the federal member. The President may also suspend any provision of the plan in the national interest. Other reservations, non-controversial, relate to housekeeping functions to make certain federal laws relating to labor, contracts, etc., applicable to the Commission, or to clarify some provisions, as by making certain that other laws were not affected. (See Muys, 206a-225.)

It is difficult to conceive of such a compact being today adopted on the Missouri, or of how the Delaware Compact could be adapted to fit western problems. Yet it is not difficult to imagine circumstances that would present the states of the basin with intolerable alternatives, or irresistible advantages that might create a favorable climate for such an arrangement. The federal government might make a lawsuit impossible, the federal agencies might be unwilling to initiate or submit to Congress plans that would settle the fate of states, and Congress might be unwilling to shoulder so disagreeable a task. The states might find themselves unwilling to gamble such high stakes on a single suit, or they might find a once-for-all solution unattractive and feel the need for a continuing process in a friendly forum in which they have a vote.

CONCLUSIONS

Conflicts

The scenarios developed in the previous chapters show that two quite different conflicts may arise within the Missouri Basin. The first is the almost certain collision between depletions in the upper basin for irrigation and energy uses, and instream uses in the lower basin for navigation, hydroelectric power, and recreation. The second is the possible rivalry between the states of the upper basin for shares in the amount of total allowable depletion if the decision in the first clash is made in favor of the downstream states. Legal solutions to these conflicts may take three forms.

Judicial Solutions

It can be predicted that an interstate lawsuit brought by the lower basin states in the Supreme Court, asking for an equitable apportionment of the river, would probably fail. In the first place, such a suit would undoubtedly be governed by the rule that the plaintiff states must show a substantial injury to present interests or a threatened invasion of serious magnitude to existing rights. This is not likely to occur before the year 2000, and probably not before 2020. A suit might be triggered by a single large project that presents such a threat, but one brought against a smaller project to establish a principle would probably be dismissed as premature.

Secondly, there are precedents which indicate that a state cannot claim a legal right to continued navigational benefits provided by the United States -- they must look to Congress for these. Here Congress has already spoken; the legislative history of the O'Mahoney-Millikin Amendment shows that neither any state nor any person acquired any rights under the 1944 Flood Control Act or the 1945 Rivers and Harbors Act which provided the navigational features on the Missouri. The same is true of the loss of cheap hydroelectric power, and the environmental harms by themselves are probably insufficient to block the federal projects that would cause depletions.

If some judicial or congressional constraint required the upper basin states to limit total depletions to a level that would preserve navigation, it would also require that each state limit its own depletions at some level far below its foreseeable potential. A judicial apportionment of the permissible depletions among the states could be the second round of a suit by the lower states against all the upper states, or it might be initiated by one against the others. If the decision in favor of navigation comes late, after the upper states' diversions have exceeded the permissible total, this phase of the case could fit the pattern of the interstate

litigation on the Laramie and North Platte rivers, in which the Supreme Court divided overappropriated streams. The guiding principle of equitable apportionment in such suits was the protection of existing rights, primarily by the application of prior appropriation across state lines. More probably, such a suit would be brought to seek a court-imposed division of unappropriated waters, to allocate to each state of the upper Missouri Basin its share of the total allowable depletions. There are some precedents against this, but the Supreme Court would probably be disposed to adjudicate conflicting claims to unappropriated water if development was otherwise stalled. In unusual circumstances, if other upper basin states were developing at a faster pace and threatened to seize all the allowable diversions, Montana might wish to initiate such a suit.

Because the United States has so many interests in Bureau of Reclamation and Corps of Engineers projects on the Missouri River and a decree in any interstate suit would materially affect its operation of present and future works, its presence in the suit would be imperative. Yet since the United States cannot be sued without its consent, it could, if it chose, require the suit to be dismissed simply by refusing to voluntarily join it.

Congressional Allocation

Congress allocated the water stored behind Hoover Dam on the Colorado River by refusing to construct the dam until California agreed by legislation to limit its claim to a certain amount, and by contracting with Arizona and Nevada to deliver specific quantities of water to them. It is believed that Congress could also allocate water to a state by constructing in that state a project that needs a certain amount of water for its operation, and that in such a case the Supreme Court could not decree nor the states agree that the state in which the project stood should take a lesser amount, incompatible with full operation of the federal works. It is highly unlikely, however, that Congress would simply divide water up among states as is done by decree or compact, without some federal purpose or project in mind.

It has been speculated that the Pick-Sloan Plan, in which Congress authorized the main stem dams primarily for flood control, navigation, and power and a number of upstream projects for irrigation and power, might be a congressional allocation. The tentative nature of the authorization for the upstream works and the fact that many have been abandoned seem to indicate that no firm allocation was intended. But with that plan, Congress enacted the O'Mahoney-Millikin Amendment, to the effect that the use for navigation of waters arising in the western states shall not conflict with the beneficial consumptive use of the water for domestic, municipal, stock, irrigation, mining, or industrial purposes. Although this might be construed as merely a protection against consumptive use rights being taken for navigation, the legislative history rather clearly points to an

intent to declare a permanent policy that the construction of navigation works will not block future irrigation and consumptive projects, that those projects can be built even though the water they consume depletes the flow in a navigation channel.

Interstate Water Compacts

Compacts can be regarded as settlements of possible lawsuits. As in other settlements, the parties try to negotiate from positions of strength but they often settle on the basis of their weaknesses. A compromise may look better than the worst that might result from a suit.

Today the lower basin is hardly in a mood to agree to the cessation of navigation, nor is the upper basin willing to forego its chances for growth, but an agreement is not inconceivable. It may depend on further studies, on research of particular compromises, on identification of possible solutions. If the upper basin-lower basin differences are settled by suit, Congress, or compact, on some basis that allows the upper basin less than free rein to develop for all needs as they appear, then the upper basin states would face the familiar task of dividing what surplus there is among themselves. This is the role most compacts have played.

If instant allocation for all time seems impossible of achievement, yet the states of the basin desire a major voice in their future instead of having it decided by Congress or the courts, an interstate and possibly federal-interstate agency could be created to plan for the basin, control to some extent the development in each state, approve projects, and determine the direction of change.

Still another possibility might exist, a combination of the compact and congressional approaches. A new version of a Pick-Sloan Plan might arise, a new overall solution by Congress of the modern problems of the Missouri Basin. Such a "Missouri Basin Act" could only become a reality if each state's water agency had had a hand in fixing the state's needs and demands, if major agreements had been reached by the states, and if the state delegations to Congress then took over the bargaining process. Congress might then, with the aid of committee staffs and federal agencies, hammer out a final settlement. The result might not be totally in accord with the wishes of every state, but it could be sufficiently equitable and fair to permit congressional resolution of the lesser sticking points and congressional override of objections that would allow a single state to block an overall settlement by compact.

A. E. Mathews — 1867

CITADEL ROCK

CHAPTER VI

Evaluation Of Water Rights Claim Methods

CHAPTER VI - EVALUATION OF WATER RIGHTS CLAIM METHODS

INTRODUCTION

This study has described the potential conflict in the Missouri River Basin which might arise in the next 20 to 40 years--namely between future additional depletions and navigational needs. This conflict may be resolved by the Supreme Court (equitable apportionment), by Congress, or by the Missouri River Basin states through negotiations.

The tone of these three processes varies. Equitable apportionment is a judicial decision based on legal precedent (case law), statutory law, and water resource data. Interstate compact and congressional apportionment solutions derive from a negotiation process based on water resource data and political compromise. In equitable apportionment, which is an adversary process and one that is dictated by legal precedent, the water rights/use claim methods may be held to a stricter standard than in the other two processes. For example, in the case of equitable apportionment, a claim for future water use generally must be shown not to be of a speculative nature. On the other hand, the speculative test may be less of a criterion in a congressional or interstate negotiated proceeding.

Additionally, the criteria may vary slightly depending upon the type of conflict. What is the issue:

- o protecting existing uses?
- o operating an over-committed river?
- o dividing unappropriated waters among future users?

For example, in a water shortage, the identification and quantification of current uses might be held to a more precise standard, wherein priorities, depletions, abandonments, and preferences are required to be carefully identified. In a water surplus situation, current water uses might be grossly identified, or perhaps not even quantified at the time of the allocation, as occurred in the Yellowstone River Compact.

However, the varying circumstances and processes dictate only refinements in the basic requirements. These basic components are:

(1) identification, quantification, and legal protection of existing water uses;

(2) identification, quantification, and legal protection of future water uses; and

(3) quantification of water supply.

Therefore, in anticipation of and preparation for potential entry into any one of the three allocation processes, certain general steps can and should be taken. This chapter focuses on the institutional and legal programs and framework which would be most propitious for Montana to pursue in establishing claims to current and future water supplies in any interstate allocation proceeding. Specific refinements in methodology are not included in this report, since this study concentrates on overall strategies and general methodologies.

Each of the three basic components identified above are reviewed in view of: (1) its general use in other allocation proceedings, (2) the degree to which it is currently being pursued by the State of Montana, and (3) an evaluation of the effectiveness of currently used methods for claiming water in an allocation process. Recommendations for improvements in claim methods are given in Chapter VII, along with cost and time requirements for implementation.

IDENTIFICATION, QUANTIFICATION, AND LEGAL PROTECTION OF EXISTING WATER USES

General

The allocation of water to states by any process will depend to a large extent upon claims to the existing and future use of water within each state by its citizens, agencies, and organizations. If the source is overappropriated, the allocation will almost certainly be limited to "existing rights," and quite probably to rights for existing water uses. However, the Missouri River is not overappropriated, since water rights, not uses, is the criterion. While the water of the Missouri River is used by the United States to maintain a flow for downstream navigation and hydroelectric power production, that does not mean that the river is "fully appropriated" and that additional depletions would make it "overappropriated" because no person or state has any "right" to water for these federal purposes. The federal use is not the exercise of a water right but of the federal constitutional power over commerce.

The only situation that could produce a need for a cutback in the level of existing upstream uses would occur if development had proceeded to a point where downstream navigation was impaired and the upper basin was forced by Court or Congress to reduce total depletions. This is not likely to happen primarily because lower basin states would undoubtedly challenge upper basin depletions before or at the time they reached a harmful level. But if such a stage were reached, then only completed

appropriations, where water is actually put to beneficial use, would qualify. Probably not even a permit would count as a "right" in dividing up an overappropriated source between a state where water was put to use and a state where water was only claimed. Where water is truly overappropriated and not all water rights can be satisfied from current supplies, actual uses will take precedence over any type of inchoate right that when completed would worsen the shortage and take water from current users. In Wyoming vs. Colorado, (259 U.S. 419, 1922) the Court said,

> "In fact and in law they (permits) are not adjudications, but mere licenses to appropriate, if the requisite amounts of water be there. As to many nothing ever is done under them by the intending appropriators. In such cases there is no appropriation; and even in others the amount of the appropriation turns on what is actually done under the permit."

Statements of claim filed under Colorado's old map and statement law, similar to applications for a permit to appropriate in other states, were given no effect against actual uses.

Far more likely, the upper basin states could find their future uses facing a limit beyond which depletions could not go, a limit that would prevent all states from developing up to total potential. In this situation, the existing use is also universally protected.

"Whatever the allocation formula, existing uses and/or rights are usually protected." (Rechard and Ragsdale, 1971). However, can water rights which are not quantified be included in an allocation? The Yellowstone River Compact recognizes that the beneficial uses in the water of the Yellowstone River system existing as of January 1, 1950, remain unimpaired by the terms of the compact. While there is precedent for making allocations before the rights are quantified, this makes the allocation a very nebulous one. Therefore, the process of documenting existing uses is important.

What types of uses are recognized in allocations as "existing uses"? The compacts which protect present uses/rights generally protect all beneficial uses and do not exclude uses. For example, the Yellowstone Compact recognizes "all water rights existing as of January 1, 1950;" and the Belle Fourche River Compact recognizes existing water rights as of 1943. Both compacts allow unlimited use for domestic and stock water reservoirs with the capacity of 20 acre-feet or less. Based on historic precedence, it is assumed that in an interstate water allocation on the Missouri River, all types of existing consumptive beneficial uses as of

the date of the agreement or a negotiated date would be recognized. Therefore, the best procedure is to document the water rights for all uses, including supplemental water use.

Montana's Water Rights Program

In an allocation proceeding, there are three important aspects of water claims for existing uses: identification, quantification, and legal protection of current water uses. Montana's water rights program now incorporates all three aspects; but this has only happened recently.[1] Prior to the Montana Water Use Act in 1973, many laws were enacted or recognized relating to water rights, and under these different laws thousands of water rights were established in Montana. They are of three types, depending on the method by which the right was obtained:

1. **Filed or appropriated rights** which were obtained by filing notices of intended use with the county, diverting the water, and putting it to beneficial use.

2. **Use Rights** which were established by simply putting the water to beneficial use. Even though not legally recorded, use rights are valid if the water user can prove the date when the beneficial use began and the amount of water used.

3. **Decreed rights** which were initiated as a use or filed right and later were involved in a water rights lawsuit and established by a court after a formal adjudication.

The Montana Water Use Act, as well as the new Montana Constitution itself, recognizes these as legal water rights. However, historically, only a portion of the water rights were documented and quantified. Additionally, no statewide, centralized records system existed. The Montana Water Use Act repealed most of the existing water laws prior to July 1,

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[1]Chapter I contains an overview of Montana's water law. The discussion here is not intended to provide an historic perspective of Montana's water rights program, but to discuss the aspects which are key to establishing Montana's claim to water for existing uses in an allocation proceeding.

1973, and included all waters of the state under one administrative system.

Montana Water Use Act of 1973 and the Statewide Adjudication. With the Montana Water Use Act, three major procedures were established which provide for a comprehensive system to identify, quantify, and legally adjudicate water rights for existing beneficial uses. The Act provided for:

(1) the initiation of a permit and certificate system of water rights administration;

(2) the general adjudication of all existing water rights in the entire State, to be accomplished on an area-by-area basis (later modified by Senate Bill 76 in 1979); and

(3) the implementation of a centralized records system to be maintained in Helena in addition to those records localized in each county.

The Act required that after July 1, 1973, persons desiring to acquire a new water right, or additional water, generally[1] must apply for and receive a permit from the Department of Natural Resources and Conservation before appropriating water or commencing construction of a diversion, impoundment, withdrawal, or distribution works. After receiving the "Permit to Appropriate Water," the claimant must construct the project, divert the water, put it to use as outlined by the permit, and then notify DNRC of completion of the water development. Any "Permit to Appropriate Water" issued by DNRC is provisional, subject to prior existing water rights and the final court determination of those rights. Therefore, in most cases,[2] a "Certificate of Water Right" will not be issued until an area has been adjudicated in the general adjudication process (see below) and all water rights are listed on a final decree. Then, if

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[1] Certain stock water ponds less than 15 acre-feet and generally most wells and springs less than 100 gpm are under different procedures than are outlined here. These procedures are not material to the intent of the generalized discussion.

[2] Wells or springs less than 100 gpm not in a controlled ground water area are the exception.

the project has been completed and the water used according to the terms of the permit (verification made by field checks), a "Certificate of Water Right" will be issued to each permit holder. The priority date of each Certificate will be the date DNRC received the original permit application.

While rights to the use of water which existed prior to July 1, 1973, were protected, the Montana Water Use Act of 1973 required that these existing rights be determined and recorded through an adjudication. The 1973 Act established an area-by-area adjudication process. This process was found to be time-consuming and expensive and was modified by Senate Bill 76 during the 1979 legislative session. However, between 1973 and 1979 existing water rights in the Powder River Basin were adjudicated.

Montana's general adjudication process today is governed by the language of Senate Bill 76 in which most water users asserting a claim to an existing right to the use of ground water or surface water arising prior to July 1, 1973, were ordered to file a statement of claim with the State. Stock and domestic uses from wells and springs, stock and domestic instream uses, and pre- 1973 rights in the Powder River Basin were exempted; however, some were voluntarily filed. The information in each claim included:

(a) the name and mailing address of the claimant;

(b) the name of the watercourse or water source from which the right to divert or make use of water is claimed, if available;

(c) the quantities of water and times of use claimed;

(d) the legal description, with reasonable certainty, of the point or points of diversion and places of use of waters;

(e) the purpose of use, including, if for irrigation, the number of acres irrigated;

(f) the approximate dates of first putting water to beneficial use for the various amounts and times claimed in subsection (c); and

(g) the sworn statement of the claimant attesting to the accuracy of the information set forth in the claim as being true and correct to the best of claimant's knowledge and belief.

In addition to the above, the claimants were required to submit maps, plats, aerial photographs, or other evidence in support of their claim.

The deadline for filing statements of existing water rights claims was April 30, 1982, and it is estimated that over 200,000 have been filed. These claims are being tabulated by basin, and under the supervision of the water court will be verified through map or aerial photo interpretation, field investigations, and comparison with known average water requirements for the basin. All irrigation claims will go through rigorous verification against aerial photos and past irrigation survey data. Claims for other uses which involve higher water demand (e.g., mining, industrial, and municipal) will also be rigorously checked for reasonableness, with some field verification. Claims for stock and individual domestic uses will also be checked but less rigorously. Qualified objectors to the preliminary decree are entitled to a hearing. Then, the water judge shall, on the basis of the preliminary decree and on the basis of any hearing that may have been held, enter a final decree affirming or modifying the preliminary decree. The final decree shall state:

(a) the name and post office address of the owner of the right;

(b) the amount of water, rate, and volume, included in the right;

(c) the date of priority of the right;

(d) the purpose for which the water included in the right is used;

(e) the place of use and a description of the land, if any, to which the right is appurtenant;

(f) the source of the water included in the right;

(g) the place and means of diversion;

(h) the inclusive dates during which the water is used each year; and

(i) any other information necessary to fully define the nature and extent of the right.

The number of acres to be irrigated will be identified on an agricultural water right, and supplemental water rights will be so identified.

When a final decree is entered, the water judge will send a copy to the Department of Natural Resources and Conservation, whereupon the Department will issue a certificate of water right. Because of the massive amount of work, it is anticipated that it will take 10 to 20 years before all final decrees and certificates of water rights are issued in the approximately 80 sub-basins in the state. However, during that period final decrees and certificates will be issued in a number of sub-basins.

The fact that all rights will not be finally quantified for approximately 10 to 20 years does not mean that Montana does not have good documentation and quantification of those uses. The claimant data for pre-1973 water rights plus provisional permits for rights after 1973 will be placed in a computerized data bank. Such information is accessible according to a number of identifying parameters, including type of use, drainage basin, water source, owner, place of use, and point of diversion.

There has been no effort to date, nor is an effort planned, to audit the general adjudication to determine the estimated percentage of compliance. However, given the value of obtaining an adjudicated water right, it is generally presumed that almost all water right claims have been filed. Additionally, initial verifications have shown that most of the claims generally reflect actual water usage and acres irrigated.

At the present time, the permitting and adjudication processes are the only means by which uses are quantified. The State does not maintain a diversion reporting program, nor is there any required annual reporting of acres irrigated and type of crops. This means that any compilation of statewide water usage is based on an accumulation of the claimed uses at the time at which the water rights claim is made. This current method indicates the maximum or legal existing usage rather than the average use which would be obtained in an annual reporting system.

It should be mentioned that in the past the state used a county-by-county mapping program, begun in the 1940's, to document irrigation uses. While the county irrigation maps can verify use for a particular area at a given period, they are not suitable for statewide documentation of present uses.

Senate Bill 76, the legislation outlining the statewide adjudication, also provided for a process to quantify Indian and federal reserved water rights. Such quantifications are necessary to make the general adjudication program of pre-1973 rights meaningful, because of the early

priority dates of the Indian and federal reserved rights. However, because these reserved rights represent existing rights for existing uses, as well as existing rights for future uses, they are discussed in a separate section.

Evaluation of Montana's Program to Identify, Quantify, and Legally Protect Existing Uses

The existing documentation program to identify and quantify existing uses claimed prior to July 1, 1973, and uses permitted after July 1, 1973, provides a good accounting of existing water rights for both ground water and surface water. There is a good faith attempt at verification of the water rights claimed for the pre-1973 rights, so as to guard against duplicate claims, claims to abandoned rights, or exaggerated claims. Additionally, field verification of provisional permitted rights before Certificates of Water Rights are issued will substantiate post-1973 rights. The current program should identify the level of existing water rights within a range of accuracy of plus or minus 10 percent. (The 10 percent variance was the criterion allowed by the Court. Nebraska v. Wyoming, 295 U.S. 40 [1953].)

The documentation programs appear comprehensive in the identification of types of use, volumes of use, source of supply, and data on which to estimate depletions. Additionally, it appears that these data are being properly stored in a computerized data system, which will allow for analysis and easy retrieval of the data for future negotiations in an interstate allocation. The main drawback to the documentation program for existing uses is the amount of time (10 to 20 years) necessary to finalize all the decrees.

IDENTIFICATION AND QUANTIFICATION OF INDIAN AND FEDERAL RESERVED RIGHTS - A CASE OF WATER RIGHTS FOR EXISTING AND FUTURE USES

General

In the past, about one-half of the compacts expressly provide that the interstate water allocations are to include all federal uses (Rechard and Ragsdale, 1971). This means that water for existing federal uses and reserved rights is often included in the state's allocation. (The term "federal" includes both Indian tribes and federal agencies.) This is an important point to note: that the reserved rights for Indians and federal agencies may not be additive to the state's allocation, but could be inclusive. In the case of the Yellowstone River Compact, however, Montana asserts that several provisions of the Compact prevail to exclude certain Indian reserved water rights from the State's allocation.

Indian and federal reserved rights are claimed for existing uses, as well as future uses for which the right has been reserved but the water has not been put to beneficial use. Federal and Indian reserved rights for future uses need not be perfected within any reasonable time period.

Montana's Program to Identify and Quantify Indian and Federal Reserved Rights

As part of the statewide adjudication effort, the Montana legislature established the Reserved Water Rights Compact Commission to negotiate with Indian tribes and federal agencies to conclude compacts for the equitable division and apportionment of waters between the state and its people and the several Indian tribes and federal agencies claiming reserved water rights. Both the Indian tribes and federal agencies have the choice of making claims directly through the general adjudication process or participating through the Reserved Water Rights Compact Commission. The procedures as provided in the legislation (Sections 85-2-702, 703 and 704 MCA) simply outline the steps to conduct negotiations, issue a decree, terminate negotiations, and resolve claims should a compact not be accomplished by July 1, 1985. The legislation does not provide any criteria upon which compacts shall be based.

At this writing, the Commission is negotiating with the tribes of five reservations in Montana and one North Dakota tribe. In addition, the state is negotiating with the federal Departments of Agriculture, Defense, and Interior for rights appurtenant to such federal facilities or land as military installations, national parks, agricultural experiment stations, national forest lands, and wildlife reservations.

Evaluation of Claim Methods for Indian/Federal Reserved Rights

The State of Montana has legitimate and necessary objectives in negotiating and quantifying Indian and federal reserved rights which objectives are a part of the strategies for an interstate water allocation. Among them is the fact that, when incorporated in the statewide adjudication, a substantial portion of Montana's existing rights will have been identified and quantified. It is important to note that the negotiations for the reserved right compacts should recognize that the amounts of water allocated to the Indian tribes and federal agencies may be a part of the share allocated to the state in any future interstate water allocation process. In addition, reserved water rights allocations within the state should represent quantities which can be reasonably and practicably put to use in the future. This is important for two reasons. First, a general standard of reasonableness and practicability will probably be used in any interstate allocation proceeding or negotiations

to identify potential future uses. (See following section on claiming water for future uses.) Second, should there be an interstate allocation, the state will want to be able to put its full allocation to beneficial use at some time in the future to maximize the economic and social benefit from such an allocation. Therefore, to maximize the benefit to the state as a whole from the reserved rights compacts, it may be prudent in the future under certain circumstances to allow such reserved rights allocations to be used off a reservation. For example, in lieu of developing all their reserved right on the reservation, a tribe may agree to allow a portion of their reserved right to be used off the reservation for a designated period of time. In developing the estimated depletions used in the scenarios in Chapter III, it was assumed that the federal and Indian reserved rights allocations would not be duplicative of other depletions. The depletion estimates looked at what might reasonably be developed for the State of Montana, regardless of the ownership of the water right.

IDENTIFICATION, QUANTIFICATION, AND LEGAL PROTECTION OF CLAIMS FOR FUTURE WATER USES

General

As mentioned above, the most likely circumstance in the Missouri River Basin would be a limitation placed on the depletions of all basin states. It would then be necessary to divide the shortfall among all basin states, or to put it positively, to identify the amount of depletion each state could cause. In general, the more firm the future user's claims are, the greater that state's share.

While in this situation existing uses would be protected, the extent to which claims to water for future use would be protected is much less certain. If demands are pressing, full protection may be given to a quite limited class. Both Article VIII of the Colorado River Compact and Section 6 of the Boulder Canyon Project Act recognized only "present perfected rights," as having first claim, unimpaired by the compact or by uses under the project. A more liberal allowance is contained in Article V(A) of the Yellowstone River Compact which states that "All appropriative rights...existing...as of January 1, 1950" will be recognized. This would include permits to construct projects (i.e., permits in good standing, kept alive by due diligence toward completion of the works). Although the permit may not be a fixed and permanent "vested" property right, it has been called an "inchoate right" (Basinger vs. Taylor, 164 P. 522, Idaho 1917), a "contingent appropriation" (In re Commonwealth Power Company, 143 N.W. 937, Nebraska 1913) and a "constructive right, an interest in real property" (Yuba River Power Company vs. Nevada Irrigation District, 279 P. 128, California 1929). Even an application for a

permit would qualify. When the water is put to beneficial use, the priority of the water right will date back to the date of filing of the permit. Such an application has been called "an inceptive right subject to contingencies" (Sowards vs. Meagher, 108 P. 112, Utah 1910).

Any claims of potential future water uses can range from those projects for which there is present assurance that they will be implemented to those in which there is little likelihood that the claimed future water need will ever materialize. The type of the interstate allocation proceeding and the availability of water supply will determine the strictness of the criteria regarding realistic potential use. In a negotiated proceeding in which there is ample surplus, the standard would be much more lenient than the case where there are numerous future demands for the available surplus supply. It would be to Montana's advantage to be prepared to meet the full spectrum of such circumstances.

Other States' Devices for Preserving Priority

In 1927 California invented a method of holding an early priority for state projects by having its Department of Finance (later the Department of Water Resources) file applications for permits to appropriate water for components of a very general plan for the eventual development of the state's water resources. (Cal. Water Code Sec. 10500). These "state filings" had priority over any applications filed subsequently, but the requirement of diligence in the completion of the application and works was waived. The state filing have since been transferred to the State Water Resources Control Board, which may release from priority or assign any portion of a state filing to a person or agency for the purposes of developments that will not conflict with the state's general coordinated plan, at which time the assignee becomes subject to the requirement of diligence (Cal. Water Code Sec. 10504). In practice, a water district desiring to construct a dam and reservoir may be assigned the state filing if the project will carry out the state water plan. If the project is desirable but not covered by the state application, the state filing is released so that the new project can receive its permit, unencumbered by the priority of the state filing. If the modern project is inconsistent with the state plan, it can still get a permit, but it will receive a current priority and must take the risk that the state filing will someday be activated and become a prior claim to the water supply. This feature, operating somewhat like a federal reserved right, has caused some criticism of the system.

Although a state might protect its own projects and plans in this fashion, such a very large paper right for highly speculative uses for which there are no present prospects would probably not be of much avail against the claims of other states with more firm foundations for claims

to unused waters. While on its face the California system looks more like a step toward an appropriation than the Montana water reservation system, in practice it seems less of one.

Since in Montana an application for a permit must be accompanied by detailed maps and statements of information, much planning and surveying must be completed before the application can be filed. This means long lead times for large, complex projects. The differential in lead times for an application between small projects and large projects could inherently preclude water from being put to its highest or most efficient use. For example, a small project for a particular location could usurp both the location and resources necessary as part of a larger, more complex project. If the smaller project were inconsistent with the larger project, the minor project would preclude development of the major project, thus perhaps limiting the efficiency and degree of benefit from the water use. Two states have enacted statutes that offer some relief from such problems. Texas appropriators initiating a large project may file a "presentation" describing the project in general terms. The priority will date from the filing of the presentation if an application follows within six months (Tex. Civ. Stats. Art. 7496). In New Mexico a notice of intention may be filed which will fix the date of priority if a formal application for a permit is made within a reasonable time (N.M. Comp. Laws Sec. 72-5-1).

South Dakota has recently created a new type of "energy industry use," to which the usual requirements of diligence for completion of the project do not apply. The period for completion of construction or application of water to beneficial use may be extended up to ten years. The permits are initially issued to the "South Dakota Conservancy District," a state agency set up for the promotion of water development, which may enter into contracts to sell or assign water rights or permits for energy industry use, up to a limit of 50,000 acre-feet of water per year.

Montana's Claim Methods for Future Uses

The best method to lay claims to Missouri River Basin water, of course, is to put the water to beneficial use -- the sooner the better. However, there are many steps which can be taken in the meantime to establish the framework for the right to use water in the future. These range from a list of projects (an inventory), to contingent water rights, to putting the water to use. Montana is undertaking most of these steps, including: (1) inventory of water development potential, (2) analysis of environmental impacts and other planning considerations, (3) establishment of water reservations for future water uses, and (4) implementation of the reservations by actual water development.

In Montana, the state legislature directed DNRC to develop a State Water Plan which essentially incorporates these components. A state water plan can be a formal study and report, conducted by the state water resource agency, which serves as a planning tool to guide decision-makers on what water development should or is likely to occur in the state. Another method for a state water plan to document and lay claim to water for future use is through the actual reservation of water. The state has used both processes. In the Flathead Basin DNRC conducted and published a water plan. In the Yellowstone Basin, the plan was developed through planning studies and formalized through the reservation process. For interstate water allocation purposes, the planning process which formalizes the potential uses through reservations, or even better, through permits for future use, is a more substantive process. The discussions which follow focus on (1) the inventory of potential water use, (2) the reservation process, and (3) water development as means to claim water for future use in Montana.

Inventory of Potential Water Development. The state has several inventories of future water uses in the state. However, at the present time there is not one data bank or source which gives the complete inventory state-wide. These inventories appear in the following reports:

(1) Upper Missouri River Basin Level B Study Report and Environmental Impact Statement, March 1981.

(2) The Future of the Yellowstone River...?, January 1977.

(3) Missouri River Basin Water Resources Management Plan, May 1980.

(4) The Missouri River Water Resources Plan, August 1977.

(5) The Flathead River Basin Level B Study of Water and Related Lands, September, 1976.

(6) The Soil Conservation Service Cooperative Irrigation Study.

(7) DNRC Inventory of Irrigable Land Resources of Montana.

Evaluation of Water Project Inventory. The inventory of potential water projects and uses is an interim claim method prior to actually reserving water for future uses. Were Montana to be called into any interstate water allocation proceeding within the next five years, the state

would have to rely solely on its current reservations, plus an inventory, to present its case for future water needs. An inventory only of resources (e.g., irrigable soils, minerals, etc.) requiring water is the weakest tool for laying claim to water for future uses. However, the inventory is strengthened if water needs are quantified as to requirements for supplemental supplies and requirements for specific lands, mineral and industrial development, livestock and domestic needs, and other uses. The inventory is further strengthened if conceptual projects are identified.

While the inventory can provide a picture of the state's potential for development and can be a good tool for policy planning, it does not establish an appropriation. Nevertheless, the inventory has been the normal tool for claiming water needs in interstate compact negotiations that allocate a surplus in the supply. The inventories have generally been the identification of water requirements for irrigable lands, minerals and other resources, along with potential water projects. The negotiating strategy has generally been to identify the water requirements for meeting all conceivable purposes.

To be useful, Montana's inventory of water requirements must be in a more usable form. The inventory could be consolidated into one format and computerized for easy retrieval and analysis. In addition, the current system does not rate the potential projects as to their probability of being implemented.

Reservation of Water for Future Use. An important way to quantify and document potential uses as well as substantiate the viability of those potential uses, is through a water reservation or conditional permit system. Montana has a statewide reservation system that allows state agencies, political subdivisions of the state (such as municipalities and conservation districts), and the federal government to apply to the Board of Natural Resources and Conservation "to reserve waters for existing or future beneficial uses or maintain a minimum flow or quality of water...." (Section 85-2-316 MCA). Under present statute, industrial users are excluded from directly reserving water. After a hearing, the board may or may not grant the reservation. The board's determination is based on

(1) the purpose of the reservation;

(2) the need for the reservation;

(3) the amount of water necessary for the purpose of the reservation; and

(4) whether the reservation is in the public interest.

The reservation under this system dates from the date that the order reserving the water is adopted by the board.

To date, the reservation system has only been used in the Yellowstone River Basin. The process was initiated in this basin because of the overwhelming quantity of water sought in applications submitted by energy companies for coal development. DNRC staff indicate that if these permits had been granted, the Yellowstone River would have been seriously dewatered during low flows. In 1974 the legislature enacted a moratorium which suspended applications for permits to appropriate water in the basin for more than 20 cubic feet of water per second and for a reservoir with a total planned capacity of 14,000 acre-feet or more. This hiatus allowed DNRC to complete a baseline study of available water resources, available lands, potential use, and potential impacts. A planning document and environmental impact statement on the Yellowstone River Basin was also completed. The board proceeded toward a comprehensive program for reservations in the basin.

After receiving reservation petitions, reviewing and verifying the needs, conducting hearings, and revising the reservation requests, the board issued the following reservations: (1) 5.5 million acre-feet for instream flows; (2) 655,324 acre-feet for future irrigation of 235,000 acres; (3) 60,913 acre-feet for municipal use, and (4) 1.2 million acre-feet for offstream storage. The process took about four years to complete.

The reservations of the water of the Yellowstone River and its tributaries made pursuant to Sections 85-2-601 to 608, and 85-2-316 MCA do not fit the traditional pattern of establishing an inchoate right (see Chapter V). The development of an irrigation reservation -- the ones of most concern in the interstate setting because of the large volumes of water involved -- is an example of the process. On December 15, 1978, the Board of Natural Resources and Conservation granted reservations to eight municipalities, fourteen conservation districts, two irrigation districts, the Montana Departments of State Lands and Natural Resources and Conservation, and the U.S. Bureaus of Land Management and Reclamation. Each reservation "allowed a total appropriation" of not more than a specified number of acre-feet of water per year, with a maximum specified diversionary flow rate in cubic feet per second, for the irrigation of an approximately specified number of acres. Each of these grants was made

in response to an application, similar to but not as definite as an application for a permit to appropriate the water. After hearings, the Board made findings of fact that rejected, limited, or modified the requested reservations. One was denied entirely; most were cut back severely.

Under the terms of the reservations each reservant shall within three years submit a detailed plan identifying projects to be developed, including a list of accomplishments to date, a construction schedule and a schedule for putting the reserved water to beneficial use that specifies the scheduling of economic, engineering, soils, and other studies. Preliminary engineering plans must show the capacity, size, and location of the works. Since the application-permit procedure is bypassed, the reservant may commence construction on approval by the Board of a detailed engineering plan. Upon review of either the preliminary plan or detailed plan, the Board may approve, modify, or deny the plan on grounds that include the nonavailability of water, inadequacy of the proposed diversion, incompatibility with local and regional planning efforts, failure to meet the basic interests of the people of Montana or the objectives of the reservation, noncompliance with state or federal laws or environmental standards, proposed uses not beneficial, or the plan does not demonstrate adequate and reasonable conservation measures or is not reasonable and is speculative. The reservant is to submit an annual progress report to the Board, and at least once every ten years the Board will review the plans to ensure that the objectives of the reservation are being met and may at that time extend, modify, or revoke the reservation upon findings that may include failure of anticipated demand to materialize, inadequate facilities, noncompliance with law, and use of the waters for other than beneficial use. The reservation is to be perfected within a set time; most of the reservants have until the year 2000, some until the year 2007.

Evaluation of Montana's Reservation System and Alternative Methods. The reservation process used on a basinwide approach is an excellent means to provide for a "unified basin management plan" that takes into account future depletions. It most probably provides a more realistic estimate of future uses and requirements than an inventory.

However, if it becomes necessary to divide the total permissible depletion of the Missouri River among the upper basin states, the question will arise as to the effect of these reservations. It seems clear that they do not rise to the level of completed appropriations. They do have the effect of preserving the 1978 priority for such projects as are eventually built, in much the same manner as an application for a permit to appropriate preserves its dates until the project is ultimately

completed. Within the State of Montana, there seems no doubt that the reservation would be decisive against subsequent applications for permits. In the interstate setting, if "priority is equity" is the criterion for dividing unused water, the reservation priority can be claimed, but it is not certain that the claim would hold up. Contrast the holder of a permit in another state, whose engineering is complete, who is exercising due diligence and whose right is certain if the project is completed, with the Montana reservant whose project is taking shape as progress is made over a twenty-year period, and whose "water right" is subject to many possibilities of review and revocation. On the other hand, the Montana reservant who is subject to oversight and who must show annual progress may have more equity than a mere applicant in another state who need not, indeed cannot, show any diligence while the issuance of his permit is postponed. A Montana reservant who has submitted final engineering plans and started upon construction is at least as meritorious as the holder of another state's permit. Certainly the Montana reservation should carry more weight than the projects listed in the typical "state water plan," which is little more than in an inventory of possibilities.

Montana's position might be improved to some extent by several legal devices that could strengthen her claim to unused Missouri River waters. Some steps might be taken without changes in the statutes. First, the reservation process could be applied in a concentrated program -- as was done in the Yellowstone River Basin--to the main stem of the Missouri and its tributaries. Secondly, the process could be extended to permit industry and energy users to make reservations on both the Missouri and the Yellowstone River basins. Energy companies and other industrial users were excluded from the reservation proceedings on the Yellowstone, although reservations can be made for any beneficial use. If reservations by private industry are not desired, the Department of Natural Resources and Conservation or some other agency of the state could make the filing, similar to (and perhaps including) the multipurpose reservation of the Department for the enlarged Tongue River Reservoir, for assignment to industry as needs arise. Water for industry could be marketed from the multipurpose, offstream storage reservation held by the Bureau of Reclamation in the Yellowstone River. (DNRC staff believe that the three multipurpose, offstream storage reservations appear to be sufficient to meet future industrial purposes.) Thirdly, and most importantly, the state might improve the position of reservants whose projects move from general concepts to engineering plans by turning the reservations into permits upon completion of the state review process.

Alternatives in addition to the reservation process might be undertaken. The general permit process might be improved. In the light of

the long lead time needed for the consumation of energy projects, regulations and administrative action by the Department could extend the life of permits prior to actual construction.

Statutory changes patterned after the devices used in other states might enhance Montana's position. A preapplication notice of intent to appropriate, like the New Mexico procedure, would enable large projects to make firm claims after plans had crystallized but prior to the preparation of detailed engineering blueprints. Some combination of the California and South Dakota schemes might be thought desirable. An application to appropriate water for energy use could be filed by a state agency or public district created for the purpose. The permit might even be issued to it. South Dakota uses the state conservancy district device to require the energy industry to contract with the state agency for an assignment of the application or permit on terms favorable to the state, in consideration of payments for water and construction and use of joint facilities capable of multiple use by other sectors of the economy, such as cities and irrigation districts.

The exact changes to Montana's statutes should be developed by the state's attorneys; but the primary recommendation here is to strengthen the claim to future water by establishing a contingent permit or inchoate water right for the reservation of future water use.

Water Project Development - General. The best way to claim water in an interstate allocation is to have the water already put to use or in the development stage. Therefore, as will be outlined in Chapter VII, it is in the interest of the state to encourage and enhance water development if it wants to claim what it perceives as its share of the Missouri River Basin water supply. A state program to encourage water development would have three components: (1) a legal framework to claim the rights, (2) state funding assistance, and (3) technical assistance.

Montana's Water Development Program. The Water Development Program was instituted by the Montana legislature in 1981. The purposes of the program are:

(1) provide for rehabilitation of state-owned projects;

(2) develop hydropower in state-owned dams;

(3) assist in the implementation of water reservations;

(4) promote offstream and tributary storage;

(5) promote joint state-tribal-federal water development; and

(6) establish a loan and grant program for water development projects and activities.

This program is funded by 30 percent of the interest income from the Resource Indemnity Trust Fund ($600,000 per year) and the income from state-owned water development projects ($300,000 per year). In addition, it receives a portion (0.625 percent) of the coal tax trust fund ($800,000 per year) for the loan and grant portion of the program.

In 1981, the legislature also established a $250,000,000 bonding authority to be used for water development projects and activities. These bonds will be backed by the coal severance tax and the projects will be approved on a case-by-case basis by the legislature. Water development funding from the coal severance tax is also available through the Renewable Resource Development Program ($320,000 per year). Funds from the program are available only to public groups for the development of any renewable resource.

During the 1981-83 biennium the Department administered a one-time program called Small Water Project Construction Loans. The total amount available for loans was $350,000. The small construction loan program has been administered according to the same rules and regulations as the Water Development Loan and Grant Program. However, loans will only be awarded to nonpublic groups and individuals and funding will end on July 1, 1983.

Through the DNRC-administered loan and grant program about $1.5 million is available each biennium to fund water development activities and projects such as construction of dams and reservoirs, control of saline seep, development of water-based recreation facilities and opportunities, stabilization of stream banks and erosion control, development of water supplies, irrigation system development or repair, rehabilitation of existing projects, and development of water conservation measures. Loans are limited to the lesser of $100,000, 10 percent of the funds available for loans, or 80 percent of the fair market value of the security given for a loan. Grants to private entities are limited to 25 percent of the project cost or 5 percent of funds available, whichever is less. There is no maximum limit for grants to public bodies.

Entities eligible for the loan or grant program include divisions of state government; cities, or other subdivisions of local government; and private applicants such as associations, corporations, other nongovernmental entities and individuals.

As provided by law, the criteria for approval of a project by a private entity are as follows. The project must: (1) advance the objectives of the water development program; (2) be located in Montana; (3) be economically feasible; (4) be an efficient use of natural resources; (5) be multipurpose as far as practical; (6) comply with statutory and regulatory standards; (7) provide associated public benefits; and (8) be needed to accomplish the stated purpose. The criteria for public projects were developed by DNRC and are similar to those set for private entities.

A project that meets these requirements will then receive priority based on the following criteria which are set by law:

(1) water storage projects will receive priority;

(2) projects that are part of a family farm will be given preference;

(3) projects with strong public benefits will receive priority;

(4) projects or activities using or developing reserved water will receive preference;

(5) projects that allow DNRC to achieve geographic balance within the program will be given preference; and

(6) projects which fully utilize water resources and promote conservation and efficient use will be given preference.

The water development program not only provides funds for promoting and advancing the beneficial use of water in Montana; it also provides technical assistance. At the time of this report, two engineers on the DNRC staff are assisting conservation districts in the Yellowstone Basin to develop their water reservations. This assistance involves helping the districts prepare an implementation plan which is required by the Board of Natural Resources and Conservation, institute administrative procedures for the use of the water, and then develop specific projects. It is estimated that by July, 1983, all 14 conservation districts involved will have submitted their development plans to the Board of Natural Resources for approval. These development plans will provide basic preliminary information on the proposed projects, including basic engineering parameters for the project (point of diversion, means of conveyance, place of use, soils, type of irrigation, and crops to be irrigated), economic evaluation, and a projected implementation schedule.

These are the type of data which are generally required in other states for conditional permits.

Evaluation of Montana's Water Development Program. It is important that Montana has already begun a state program for water development, since the actual application of water for beneficial use is the strongest method by which to retain water within the state. The public's reception to the program has been excellent, and, in the first grant/loan period, DNRC received 140 applications which amount to funding requests for an approximate $27 million. Only about $1.6 million is available each biennium, but a $5 million bonding authority can be used to make additional loan funds available. In addition, some of these projects may be funded through the $250 million coal severance tax bonding authority. Unmet needs may remain, in which case the legislature should consider increasing the funding for the first five to ten years to speed up that development. In addition, the state may wish to consider dividing the program funds into (1) those which would be used primarily to encourage preparation of development plans, and (2) those which would be used for actual project implementation. The former assistance could be in the form of grants to public and private entities to develop their own plans, or funding additional state personnel to assist in project plan development, or a combination of the two methods. DNRC staff could also be given the authority and responsibility to assist in developing and evaluating project applications for the $250 million bonding program. This would provide an administrative procedure to enable timely use of this bonding authority. At the present time, applicants must approach the legislature directly for project approval.

QUANTIFICATION OF THE WATER SUPPLY

The river gaging program is primarily the responsibility of the U.S. Geological Survey and the majority of gaging stations throughout the state are installed and monitored by that agency. A few stations are maintained by the state and other federal agencies. Generally, the mainstems of all the rivers are well gaged; the tributaries have considerably less coverage. For instate water management, this is a problem; however, for interstate allocations, gaging is only necessary on the main stems and tributaries at the state's borders. Thus, the current water gaging program in Montana appears to be adequate.

There are additional water supplies which should be measured, if they become significant in the future. Presumably, any interstate

allocation would divide the surface waters[1] of the Missouri River Basin. However, water users in the Missouri River Basin in Montana might tap sources which are outside the MRB surface water system. These sources would include water from deep aquifers which are not hydraulically connected or are remotely connected to the surface water system. "New" sources of supply should not be counted as part of the flow to be divided among all states. But rather, use of "nontributary" ground water or other new sources should provide a supply in addition to any allocated flow to Montana. If these "new" sources become significant, accurate records quantifying that supply should be maintained.

CONCLUSION

Montana has established the basic methods necessary to claim water for existing uses as well as future uses. In addition, the state is making a good effort towards water development. As identified in this study, the main improvement which can be made in claiming water for future use is in the reservation system. Montana's water reservation system gives the future water user a better status in the early stages than a mere water plan or inventory, but in the later stages it is not as firm a water right as a permit. This status may put Montana reservants in a less favorable position when compared to downstream users who have contingent water rights or permits. By issuing a permit to the reservant at the time the development plan is approved, the reservant becomes assured of a right to develop the water as long as due diligence is performed.

Additionally, the study has identified the importance of placing additional technical and financial resources in Montana's water development program. It is important to bring potential projects from the inventory stage through the preliminary engineering and economic analyses necessary to establish viable projects and lay claim to the water for those projects.

Montana may also wish to consider water right permits for industry which would allow long lead time for development and implementation. At the present time, since any nongovernmental sector, including industry,

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1 This study included depletions for use of ground water that is closely interconnected to the surface water system. Nontributary ground water that might be subject to interstate allocation, such as the Madison formation, is outside the scope of this report on the surface waters of the Missouri River Basin.

is excluded from the reservation process, it must claim water by putting the water to immediate beneficial use, or contracting for water out of existing reservoirs. If the latter is the more favorable policy position for the state to take, then a greater effort should be made to market the water and commit it to beneficial use in the future.

Lastly, by quickly improving and consolidating the inventory of future water requirements and projects, the state would have an immediate tool to assert its future requirements for meeting all its purposes.

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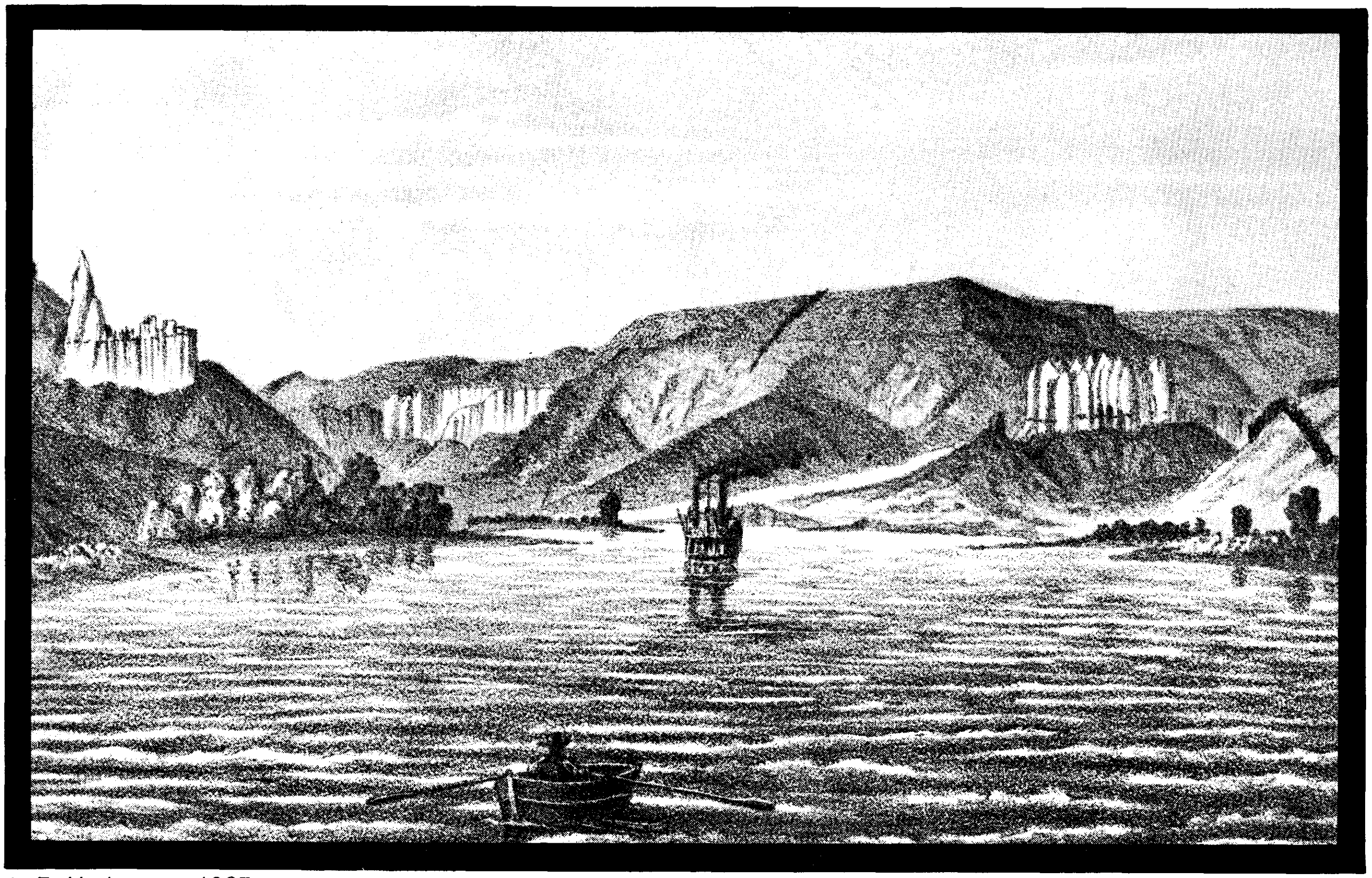

A. E. Mathews — 1867

THE CHURCH, CASTLE AND FORTRESS

CHAPTER VII

A Montana Strategy For Interstate Water Allocation

CHAPTER VII - A MONTANA STRATEGY FOR INTERSTATE WATER ALLOCATION

STUDY DIRECTIVE

Montana's water and related land resources provide a quality environment in which to live, work, and relax. Indeed, it is this state's concern that its water resources are managed in a manner that will maintain this quality environment and assure an adequate supply of water is available for meeting our future municipal, agricultural, industrial, and other needs. With this in mind, the 1981 Montana Legislature directed the Department of Natural Resources and Conservation to develop a strategy to protect Montana's options for future instate water use in the face of expanding water development by downstream states. A feeling prevalent in Montana is that the water flowing out of the state will soon be claimed by downstream states whose use of water is growing more rapidly than Montana's. This could preclude or limit future water development in Montana. It is also feared that, given the political power of lower basin states, Montana could find it difficult to defend its claimed right to future instate use of water in a national political arena. To compensate for these possible problems, many Montanans feel that the state must develop the best strategy to protect its interests in an interstate water allocation conflict.

FOCUS OF THE STRATEGY

The State of Montana contains three major river basins; the Columbia River Basin (25,400 square miles), Missouri River Basin (121,000 square miles) and tributaries of the Hudson Bay (600 square miles) (Figure I-1). The Columbia River Basin in Montana contains two important drainage basins: the Kootenai and the Clark Fork. The Missouri River Basin also contains two major drainage basins: the Yellowstone and Upper Missouri.

Streamflow records indicate that the average outflow of water from Montana is about 43,895,600 acre-feet per year. Of that amount, about 59.3 percent (26,040,000 acre-feet per year) flows into the Columbia River west of the Continental Divide. Another 2.3 percent (989,200 acre-feet per year) flows north into the Hudson Bay. The remaining 16,866,000 acre-feet per year, or 38.4 percent, flows downstream into the Missouri River system.

The potential for conflict in the major drainage basins of Montana was evaluated. The results from this evaluation revealed that the greatest potential for conflict is in the Missouri River Basin of Montana.

In the Clark Fork Basin of Montana, the amount of water available for the development of new consumptive uses is apparently limited because of prior rights for hydroelectric power. The 397 mw hydroelectric power plant at Noxon Rapids owned and operated by Washington Water and Power has a direct flow water right of 35,000 cfs with a 1960 priority and 15,000 cfs with a 1974 priority. A DNRC water availability analysis (Fitz, 1981) showed that no surplus water is available in three out of ten years on the average and that which is available only occurs between May 10 and June 25 in the other seven years. Thus, the unclaimed water available to support new large-scale consumptive uses in the Clark Fork Basin of western Montana is somewhat limited and the development of storage facilities would be needed to put it to use.

In the Kootenai River Basin, a large volume of water is apparently available for future consumptive uses. However, the demand for consumptive purposes appears to be limited because of the high annual rainfall and the lack of irrigable lands.

Even though the Columbia River Basin of Montana was de-emphasized in this study, this is not to say that the opportunity for conflict does not exist. The Columbia River system is already highly developed for instream hydropower uses. Potential conflicts exist beween Montana's consumptive use needs and the maintenance of instream flows for hydroelectric power production, both instate as well as among downstream states. However, the Department chose to concentrate this study on the problems of interstate water allocation in the Missouri River Basin since the greatest threat from downstream states arises in that basin.

DESCRIPTION OF THE MISSOURI RIVER BASIN

Montana is the headwaters of the Missouri River. Together with its major tributary, the Yellowstone River, the Missouri River flows through Montana, downstream through North Dakota, South Dakota, Nebraska, Iowa, Kansas, and Missouri. The Missouri River and its tributary streams in those states and in Wyoming, Colorado, and Minnesota are important sources of water for such consumptive development as irrigation, and municipal, and industrial use. Figure II-1 shows the Missouri River Basin and its tributaries, and the division between the upper and lower basins at Sioux City, Iowa.

Montana is an important contributor of water to the Missouri River system. At the 1975 level of depletion, the average annual outflow from Montana in the upper Missouri River is 7,774,000 acre-feet per year; at the Montana state line the average flow of the Yellowstone and other tributaries is about 8,804,000 acre-feet per year. Montana contributes about 50 percent of the average streamflow at Sioux City, Iowa

(21,725,000 acre-feet per year), and 19 percent of the streamflow at the mouth of the Missouri River (54,559,000 acre-feet per year) near Hermann, Missouri.

NATURE OF THE CONFLICT

The potential for conflict in the Missouri River Basin is real and involves the 1944 Flood Control Act, commonly called the Pick-Sloan Missouri Basin Program. This Act combined two plans, one by the Army Corps of Engineers (the Pick Plan) and the other by the Bureau of Reclamation (the Sloan Plan). The Corps plan focused on the construction of large main stem reservoirs on the Missouri River for flood control and the development and maintenance of downstream navigation. The Bureau plan involved the development of water for consumptive purposes, primarily irrigation.

In passing the Act, Congress authorized a system of six main stem reservoirs, including the existing Fort Peck Dam, to control floods and to provide navigation in the lower Missouri River Basin. Hydroelectric power produced at these main stem dams and other dams in the basin is an important source of energy, primarily in the lower basin.

Beside the flood control and navigational benefits, Congress recognized the importance of water development for other purposes and authorized many irrigation projects and storage reservoirs throughout the upper and lower Missouri River Basin. Congress also adopted the O'Mahoney-Milliken Amendment which specified that providing streamflows for navigation was not to interfere with upper basin development of water which arises west of the 98th Meridian. This provides consumptive uses in Colorado, Montana, Wyoming, South Dakota, North Dakota, Kansas, and Nebraska.

The lower basin states have been receiving current level benefits from the 1944 Act since the mid-1960's, when the last of the six main stem reservoirs was completed. These reservoirs have provided the lower basin states with a barge transportation industry, cheap hydroelectricity, and flood protection. In return for providing these benefits (all main stem reservoirs are in Montana, North Dakota, and South Dakota), the upper basin states were promised the development of consumptive uses under the Pick-Sloan Plan. To date, only a few of the federal water projects for consumptive purposes have been completed and many contemplated projects have not been started. Recent actions by the upper basin states to develop these projects have initiated the conflict between the upper and lower basins. The lower basin states perceive upper basin development as a threat because they do not want to lose any of their existing benefits and also want water available for their future consumptive development. Thus, they have begun to challenge upper basin development in order to prevent additional upstream consumptive uses. These and other challenges to Montana take many forms, but four are of particular concern:

(1) Energy Transportation Systems, Inc. (ETSI) has purchased 50,000 acre-feet per year of Lake Oahe water from South Dakota and the Bureau of Reclamation. ETSI plans to transport Missouri River water 280 miles to the coal fields near Gillette, Wyoming. From there, water would be used to slurry Wyoming coal 1600 miles to power plants in Arkansas and adjacent states. Although this quantity of water is only about two-tenths of one percent of the average annual flow (21,725,000 acre-feet) at Sioux City, Iowa (equivalent to one-eighth to one-tenth of the total water that evaporates each year from Oahe Reservoir), the states of Missouri, Iowa, and Nebraska are concerned that this sale and interbasin transfer of Missouri River water will set a precedent.

Several pieces of legislation have been introduced by the lower basin states to control upstream water use. The State of Missouri passed legislation authorizing its Governor to enter into an interstate compact among the lower basin states for the protection and development of barge traffic on the Missouri River. Representative Bedell of Iowa introduced H.R. 5278 in the 97th Congress to prohibit any state from selling or otherwise transferring interstate waters located in the state for use outside that state unless all other states in the drainage basin consent to the sale or transfer. If passed, this bill would have the effect of prohibiting all sales and interbasin transfers from the Missouri River Basin. Representative Young of Missouri introduced a bill, H.R. 7151, that would grant the consent of Congress to the states of the Missouri River Basin to negotiate and enter into an interstate compact for the equitable allocation of the waters of the Missouri River Basin. Disturbing features of the bill require that any compact or agreement shall not cause deterioration in the water quality of any state of the Missouri River Basin and shall not reduce the navigational capacity of the Missouri River.

In addition, two lawsuits (the States of Missouri, Iowa and Nebraska vs. Colonel Andrews Jr. et al., and Kansas City Southern Railway Company et al. vs. Colonel Andrews Jr. et al.) were filed August 1982 in the U.S. District Court in Nebraska. These suits attempt to halt the ETSI sale and diversion, contending that the Department of Interior unlawfully approved the 50,000 acre-feet per year depletion and the Corps of Engineers unlawfully issued a permit for construction of a water intake facility to make the depletions possible. The overtones to these two lawsuits suggest that the lower basin states would like to curb future depletions in the upper basin by having the 1944 Flood Control Act reinterpreted.

(2) The High Plains study proposes alternatives that may present a threat to Montana and the other basin states. This $6 million Department of Commerce study, authorized by Congress in 1976, looked at alternatives for assuring adequate water supplies to the High Plains states where the Ogallala aquifer is being rapidly depleted. The affected states include Oklahoma, Colorado, Kansas, Nebraska, New Mexico, and Texas. By the year 2020, ground water depletions in this area are estimated to result in a loss to irrigation of more than one-third of the 14.3 million acres now supplied from the Ogallala aquifer. The High

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Plains Study Council, consisting of the governors of the six states, has chosen several mitigating solutions, but the only long-term solution is to import water into the High Plains region. Two of the four import alternatives would divert about four million acre-feet per year from the Missouri River at either Lake Francis Case behind Fort Randall Dam or at St. Joseph, Missouri.

(3) All of the other upper basin states are identifying water development priorities for the 1980's. For example, North Dakota's top priority is to develop 250,000 acres of irrigated land with water from the Garrison Reservoir Project. South Dakota wishes to withdraw 1.5 million acre-feet per year for irrigation in the Central South Dakota Project (CENDAK). Wyoming has authorized $114 million for water development as a first step in a possible six-year, $600 million statewide water development program.

(4) Threats to upstream Missouri River water use could also arise from studies by the Army Corps of Engineers. The Missouri River Division of the Corps is completing a study of Mississippi River navigation that includes an analysis of the effects of Missouri River flows. Navigation on the Missouri River annually produces about $20 million in benefits from the transportation of three million tons of freight. In contrast, more than 50 million tons are transported annually on the Mississippi River. Preliminary results of the study indicate that regulation of the Missouri River has a significant effect on the flows of the Mississippi River. No current authorizations relate the Missouri River regulation to benefits on the Mississippi, but the Corps of Engineers' study could lead to suggestions that Congress consider such authorization. Additionally, the Corps is contemplating the development of a railroad-barge combination which would allow barge traffic to transport 17 million tons of coal per year downstream of Sioux City, Iowa. This would increase total barge tonnage to the projected level of 20 million tons per year, and would only intensify the problem between the upper and lower basin states.

TIMING AND MAGNITUDE OF POSSIBLE WATER CONFLICT

A major part of this study attempted to define the timing and magnitude of potential water conflicts in the Missouri River Basin. The objectives of this assessment were:

(1) To provide factual information for an analysis of the economic impacts of various water allocations;

(2) To provide technical support for legal conclusions regarding the possible need for water allocation and kinds of allocation that might be considered; and

(3) To establish the magnitude and timing of conflicts so that a strategy for water allocation can be devised.

High, medium, and low projections of future water consumption and development were derived for Montana and the rest of the basin. The projected depletions include uses for irrigation, energy, municipal, industrial, interbasin diversions, and others for four planning periods, 1975-1990, 1975-2000, 1975-2020, and 1975-2040 (See Tables III-7 and III-8), and are identified by river reach. These projections were based on a thorough literature review of available reports issued from such agencies as the Missouri River Basin Commission, the Bureau of Reclamation, the U.S. Army Corps of Engineers, the U.S. Department of Agriculture, several agencies in each of the ten states, private entities, and local government. Primarily, the projections came from the Missouri River Basin Comprehensive Framework Study (1969), Bureau of Reclamation Water Marketing Study (1974), and Missouri River Basin Commission Level B Studies. These projections were then evaluated and modified in this study to make them more realistic.

The projections were combined into eight scenarios, shown in Table III-11, for testing the sensitivity of the main stem reservoir system to depletions upstream of Sioux City, Iowa, and for identifying possible impacts of future water development on navigation and hydropower benefits. These depletion scenarios were run through the computer operations program for the six main stem reservoirs by the Army Corps of Engineers, Missouri River Division, Reservoir Control Center. The operation studies took into account the depletions of water under each of the water use scenarios and simulated operations of the reservoir system in accordance with the criteria established under the 1944 Flood Control Act and subsequent authorizations and cost allocations.

The results of the analyses summarized in Tables III-20 and III-21 are based on the assumptions in the Corps of Engineers main stem reservoir accounting model, the assumed depletion scenarios, and the calculated flows at the 1975 level of development. These were the best data available at the time of the study. It should be noted, however, that it is very unlikely that the high depletion levels used here will be developed within the study period (1975-2040).

Continued water development in the Missouri River Basin will reduce stream flows in the main stem, result in a progressive reduction in hydropower production from the six main stem reservoirs, and eventually adversely affect navigation. However, no water shortages are projected from the main stem Missouri River by the year 2000. On the other hand, water shortages already exist on some of the tributaries of the Missouri River such as the Platte and Kansas rivers, but they should not affect the main stem of the Missouri River as a whole.

Simply stated, the nature of the potential future conflicts in the main stem of the Missouri consists of competition between water for maintenance of instream flows to accomodate navigation and hydroelectric production versus depletions of water for consumptive purposes. Depletions of water on tributaries of the Missouri River downstream of Sioux City, Iowa were found to have little or no effect on navigation when upper basin depletions were held at the "threshold" level which amounts

to 1.6 to 1.7 million acre-feet per year over the 1975 level of development. The threshold level of development may be thought of as a maximum "firm supply" that could be developed without affecting navigation during a severe drought. In an average year, there may be as much as 5.3 million acre-feet available for future development and depletion.

Depletion of water from the main stem and tributaries above Sioux City, Iowa would have an effect on navigation since the six main stem reservoirs above Sioux City provide the necessary regulation of flows to maintain navigation in the lower basin.

Navigation will not be affected unless both of the following conditions occur: (1) the threshold level of depletions is surpassed, and (2) a severe prolonged drought such as the nine-year drought between 1934-1942 recurs. If water is developed at the low projection above Garrison and the medium projection between Garrison and Sioux City, and a prolonged drought does occur, navigation would be affected after the year 2000, but before the year 2020. There could be three years without navigation service. If upper basin depletions above Sioux City, Iowa occur at the medium rate of development, navigation could be suspended for up to three years before the year 2000 and five years before the year 2020 during a severe prolonged drought. If water development occurs at the high level above Garrison and a medium level between Garrison and Sioux City (that level which is protected and defined under the 1944 Flood Control Act) a severe prolonged drought could suspend navigation for three years before the year 2000 and eight years before the year 2020.

Construction of major water diversions to other river basins would significantly reduce navigation service during a prolonged drought by the turn of the century (for example, a diversion to the Colorado River Basin as envisioned by the Exxon Corporation [1.1 million acre-feet per year], or a diversion to the High Plains region as envisioned by the federally proposed High Plains Project [4 million acre-feet per year]). Navigation could be shut down completely by the year 2020 if these interbasin diversions occur and the upper basin states develop at any of the projected levels.

In absolute terms, low flow maintenance and navigation service require about 16.4 million acre-feet of water per year at Sioux City, Iowa to maintain a channel depth of 9 feet over an eight-month season. At the threshold level of depletion, the flow at Sioux City, Iowa, would be reduced to an average of 20.2 million acre-feet per year. However, during a severe drought similar to the 1934-1942 period, this depletion would lower the drought flows to an average of 11.7 million acre-feet per year. Based on available river flow data, the estimated probability of such a severe drought recurring is only 2 to 3 percent. These figures illustrate that navigation can occur long after the threshold level of depletion has been reached unless there is a severe drought. During a severe drought, there would not be enough water in the system in at least one year to sustain navigation service. If water depletion

doubles the threshold level (3.5 million acre-feet per year), the number of consecutive years of no navigation may increase to as many as four.

ECONOMICS OF WATER ALLOCATIONS

An economic impact analysis was conducted to ascertain the possible effects of interstate water allocations to Montana and to the other states in the Missouri River Basin. Economic parameters investigated for Montana included the irrigation and energy/coal sectors. For the rest of the basin, economic sectors included irrigation, navigation, hydropower, and the potential High Plains diversion.

Impacts were identified as changes from the high level of development scenario (which was assumed to be the level of development allowable under the terms of the 1944 Flood Control Act) to the development levels that might be set for enhancement of instream navigation and hydropower production. The following water allocations were assumed:

(1) Reduced upstream depletion (above Garrison) to protect navigation.

(2) Reduced upstream (above Garrison) and downstream (below Garrison) depletions to protect navigation.

(3) Reduced downstream depletion (below Garrison) to protect navigation.

Other comparisons were also made to determine the economic impacts of the High Plains diversion. Economic impacts were projected for the years 2000 and 2020.

Because of the limited study budget, the scope of the economic impact analysis was limited to measures of direct, or first level, economic return for selected water-using sectors. Therefore, the following values should not be treated as absolute measurements of the economic return to the various sectors, but rather as qualitative estimates to be used for policy determinations on allocation criteria. The different values for each water-using sector described below depend upon the projected level of development as shown in Tables IV-10 and IV-11.

The economic analyses for navigation assume, as do studies by the Corps of Engineers, that a major drought does not occur. Under these conditions, restricting water depletions in the entire Missouri River Basin has no effect on enhancing benefits of navigation service in the year 2000, and only about \$2 to \$5 million per year for the year 2020 (unless the High Plains diversion is developed, in which case navigation will be completely infeasible by the year 2020).

Revenues from hydroelectric power production would be increased if future water depletions are restricted in the Missouri Basin. The results showed that power revenues could increase between \$13 and \$24 mil-

lion per year for the year 2000 and between $14 and $29 million per year for the year 2020.

Any restriction of future upstream water development to maintain navigation would be extremely detrimental to the irrigation and energy/coal sectors of Montana. If future water depletions are considerably lower than those in the high scenario, potential annual crop values of between $35 and $69 million would be lost in the year 2000. In the energy/coal sector, state and local governments would be deprived of taxes ranging between $233 and $476 million per year. The reductions in irrigated crop revenues would be approximately the same in the year 2020 as for 2000, but state and local taxes received from potential energy/coal development could be reduced substantially, between $456 and $689 million per year.

Restricting future water development for consumptive purposes would also deprive the other basin states of irrigation crop revenues amounting to $71 to $674 million per year in 2000 and between $58 to $987 million in the year 2020.

In short, the economic impacts of restricting future water development in the basin to maintain navigation are far greater than the values of both navigation and hydropower gained from limiting future consumption.

FORMS OF WATER APPORTIONMENTS USED TO RESOLVE CONFLICT

Interstate water allocation has been accomplished in the United States in three ways: equitable apportionment (water apportioned by the U.S. Supreme Court to settle disputes brought by a lawsuit among states); Congressional apportionment (action taken by Congress to settle water disputes among states); and interstate compacts (negotiated agreements among the states to administer water shortages, to divide water surpluses, or to provide planning and regulatory functions).

A detailed legal review on each of the three allocation methods is presented in Chapter V and will not be repeated here. What is important, however, is to be able to predict the possibility that one of these three means of apportionment will be used and also to be able to identify the ramifications of each as they relate to the Missouri River Basin situation. Figure VII-1 diagrams these possibilities.

Congressional Apportionment

Although there appears to be a question among the lower basin states as to whether or not the 1944 Flood Control Act allocates water among the Missouri River Basin states, it currently provides the assurance, through the O'Mahoney-Milliken Amendment, that future consumptive uses in the upper basin have preference over instream flows for navigation in the lower basin.

FIGURE VII-1

SCENARIOS OF MISSOURI RIVER BASIN ALLOCATION PROCEDURES

ACTION	RESULT	EFFECT
I. EQUITABLE APPORTIONMENT (INTERSTATE LAWSUIT)		
• Lower basin vs. Upper basin Suit to enjoin threatened harm from single project on combined depletions. Principal defense, O'Mahoney-Milliken Amendment.	Lower basin "wins." Harmful depletions enjoined.	Allowable depletion divided among upper basin states by: o Lawsuit o Compact o Congress
	Upper basin "wins." All depletions permitted.	No allocation needed. Sufficient water for all states consumptive uses.
• Upper basin vs. Lower basin Depleting projects blocked by uncertainties caused by downstream claims; suit to declare rights.	Upper basin "wins."	Projects proceed.
	Lower basin "wins."	Possible need for allocation among upper basin states, as above.
• Upper basin states vs. Each other. Upper basin depletions restricted to low levels (by any process); suit to divide permissible depletions.	Share of available water allocated to each state.	State Agencies restrict permits to state's quota.
	Refusal to divide unappropriated water.	Compact or Congressional allocation.
• U.S. refuses to become a party to any or all of above suits.	Suit dismissed.	Compact or Congressional allocation.
II. INTERSTATE COMPACT (VOLUNTARY AGREEMENT)		
• All Missouri Basin states agree to solve conflicts by compact; Congress grants consent to negotiate.	Water allocation compact that limits upper basin to low or medium development, with compensating advantages to upper basin.	Need for supplemental compact on suit to allocate water among upper states.
	Water allocation compact that allows high upstream development with compensating advantages to lower basin.	Upper basin states develop fully without allocation between them.
	Delaware type water management compact, U.S. joins as party, compact creates commission.	Upper basin projects proceed as per commission approved plans.
	Negotiations fail.	Resort to: o Interstate lawsuit o Congress
• Upper basin held to low depletions, by any process.	Water allocation compact that divides available water.	State agencies restrict permits to state's quota.
	Negotiations fail.	States resort to lawsuit or Congress.
III. CONGRESSIONAL ALLOCATION (LEGISLATION)		
• Action on Upper basin projects for high and medium depletions.	Projects authorized and funded.	Allocation to upper basin; projects proceed.
	Authorization or funding withheld.	Allocation to lower basin; development held at low level.
• New "Missouri Basin Act" to solve modern basin problems; modernizing and replacing Pick-Sloan Plan.	State participation in formulation, solution fair to all states, agreeable to most, possibly Congressional enactment of failed compact.	As provided. O'Mahoney-Milliken Amendment becomes obsolete, modified or replaced by new Act or action under it.
• Repeal or modification of O'Mahoney-Milliken Amendment in project bill or otherwise.	Senate passage highly unlikely.	As provided.

It is possible that Congress, however, through the 1944 Flood Control Act, has addressed the issue of apportionment of water between the states and has therefore provided its own method for allocating water among them. For example, specific language in Senate Document No. 191, accompanying the 1944 Flood Control Act, provides as follows:

> Summing up, provisions are made for the irrigation of 4,760,400 acres of land not now irrigated, and a supplementary water supply will be furnished to 446,304 acres of land now having an inadequate water supply, thus benefiting a total of 5,206,704 acres. Proposed irrigation development is scattered throughout the dryer portions of the basin as follows:

Summary of Irrigation Development (Acres)

State	New Land	Supplemental Supplies	Benefited
Montana	967,130	245,800	1,212,930
Wyoming	281,560	167,400	448,960
Colorado.	101,280	1,719	102,999
North Dakota. . .	1,266,440		1,266,440
South Dakota. . .	961,210	11,300	972,510
Nebraska.	989,445	19,930	1,009,375
Kansas.	193,335	155	193,490
Total	4,760,400	446,304	5,206,704

This Act has also been interpreted by Congress to be an allocation. In reporting on the Garrison Project legislation in 1965, the Senate Interior and Insular Affairs Committee reported:

> At the same time, however, the fundamental commitment of the Flood Control Act of 1944 should be recognized. It amounted to a compact, ratified by Congress, assuring the upper basin states that their sacrifice of productive lands to provide benefits for the lower basin would be compensated for by full development of other potentialities in the upper basin states.

The above position was advocated by the state of North Dakota at the August 1982 meeting of the Missouri Basin States Association. Any other definition or interpretation of the Amendment or Act will be extremely detrimental to the upper Missouri River Basin states.

Congressional apportionment in the Missouri River Basin could come about not only as a response to direct conflict over uses of Missouri River water, but also because of project authorization under the 1944 Flood Control Act or a redefinition of the O'Mahoney-Milliken Amendment. Congress could also direct the states to enter into compact negotiations as was recently proposed by Representative Young of Missouri.

Interstate Compacts

If there is a need for a specific quantification of the water allocation in the Missouri River Basin, an interstate compact is felt to be the most desirable means because a compact is the result of negotiations rather than adversary proceedings and should be much less costly and more responsive to state needs.

An interstate compact could be negotiated among all the basin states to define the water uses for the entire basin, or a compact could deal only with that portion of the basin above Sioux City, Iowa. The amount of water to be depleted in the upper basin could be determined from an upper basin/lower basin compact, from Congressional apportionment, or from an equitable apportionment by the United States Supreme Court. A compact would be possible among all the basin states even if there was a division between the upper and lower basin states. The lower basin would attempt to protect hydropower, navigational, and other instream benefits. The upper basin states would attempt to develop water for future depletion in accordance with the 1944 Flood Control Act. If an upper basin/lower basin allocation was formulated and a compact completed, the amount of water to be depleted in the upper basin could then be apportioned by a compact among the affected states of Nebraska, South Dakota, North Dakota, Montana, and Wyoming. The states of Wyoming, Montana, and possibly North Dakota would contend, however, that there is no need to divide the waters of the tributaries of the Yellowstone River Basin since the Yellowstone River Compact already apportions the unappropriated water among these states. This would also be true for other states involved in interstate compacts on several other tributaries to the Missouri River. Therefore, any interstate water allocation discussion must take the allocations covered by these compacts into account.

Equitable Apportionment

In Chapter V the discussion reveals that the United States Supreme Court has never allocated water in a "friendly" law suit. In every case, the court has allocated the water only after other means of apportionment have failed and there exists real harm or threat of harm resulting from increased water uses. Three possible types of lawsuits are described below.

(1) Lower Basin States vs. Upper Basin States. The threat of loss of navigation or increased environmental impacts (and possible loss of hydroelectric power production) could form the basis of a lawsuit brought by the lower basin states against the upper basin states to stop further upper basin development for consumptive purposes. The types of upper basin actions the lower basin states might consider as threats could include: water sales by the upper basin states and by the Bureau of Reclamation; funding of units of the Pick-Sloan Program; water rights issued by states for major projects; actual construction of water development projects; or the authorization of a large interbasin diversion project such as the High Plains Diversion or the Exxon proposal.

Even though it is doubtful that current harm can be shown, the two August 1982 lawsuits, filed in an attempt to halt the ETSI sale and diversion of 50,000 AF/year of water from Oahe Reservoir are examples of lower basin actions in response to a perceived threat. It appears that the lower basin states may attempt to use these court cases to limit future water development in the upper basin regardless of whether harm may or may not be shown.

(2) Upper Basin vs. Lower Basin. Possibilities of threat to the upper basin states which could prompt a lawsuit by these states could include the authorization of a large interbasin diversion project that does not include the authorization of upper basin projects or funding for projects in progress. A second potential threat to the upper basin would be if the federal government funded lower basin projects but refused to fund upper basin projects. The objectives of such a lawsuit could be to define the upper basin/lower basin water allocation or to obtain equitable benefits.

(3) Upper Basin vs. Upper Basin. The objectives of this type of lawsuit would be to define the allocations of water between Montana, Wyoming, South Dakota, North Dakota and other upper basin states. This would happen if an upper basin/lower basin allocation had been settled, but an agreement could not be reached on suballocations of water among the upper basin states. Figure VII-1 shows this as one of the possible results of any of the three general allocation methods.

TIMING OF ACTIONS TO RESOLVE CONFLICTS

An upper basin/lower basin water conflict of sorts is already in progress in the Missouri River Basin. Although the current levels of river flow are well above the requirements for downstream navigation and instream uses, the lower basin states perceive interbasin diversions, water development for energy, and water development under the Pick-Sloan Missouri Basin Program for irrigation as threats to both their instream uses and future development. Currently, the downstream perceptions are not well founded technically even though present regulation of the six main stem reservoirs "uses" most of the river flows for instream purposes. A large quantity of new water development can take place before there is any risk of curtailing navigation in the lower basin. However, the lower basin states view the recent sale to ETSI of water from Oahe Reservoir in South Dakota as the "tip of the iceberg". Since the 50,000 acre-feet per year is only about two-tenths of one percent of the average annual flow at Sioux City, Iowa (21,725,000 acre-feet) or equivalent to one-eighth to one-tenth of the total water that evaporates from Oahe Reservoir each year, it appears doubtful that the threat of harm can be substantiated. Nevertheless, because of the recently filed lawsuits and other lower basin actions, there is an immediate need for Montana to begin considering its water requirements and preparing for the contingency that some form of water apportionment process may be initiated in the not-too-distant future.

The O'Mahoney-Milliken Amendment appears to provide Montana the necessary protection of future water uses on an upper basin versus lower basin basis. But the amendment may be challenged if future upper basin depletion could severely impact the lower basin states economically. The problem of upper basin depletion conflicting with lower basin instream flows should not occur before the year 2000, and, in fact, the real threat to navigation may not exist until after the year 2020.

The timing of a perceived threat will depend upon the rate of increased depletions and upon such major actions as appropriation of water, and authorization or funding of a major project. Thus, the Missouri River Basin interstate water conflict has both short-term and long-term aspects. The major differences between the short-term and long-term are the extent to which water depletions increase in the basin and the perceived threat versus the real threat. Both short-term and long-term aspects can involve all three of the allocation methods -congressional apportionment, interstate compact, or equitable apportionment.

Short-term Potential Actions to Resolve Conflict (1982-2000)

The short-term and ongoing conflict involves many political aspects and may be viewed as that period when any harm to instream flows is seen as a threat but cannot be substantiated. Lower basin states may try to "keep the water flowing" by opposing Congressional funding of upper basin water development projects, or by imposing federal or state requirements for water depletion permits or approvals.

Attempting to impede upper basin development could lead to compact negotiations. The pressure to enter negotiations might stem from the states themselves out of the need to eliminate uncertainty and to resolve the political aspects of the conflict. The mandate for negotiations could also come from congressional action that would require the states to define their water allocations before the authorization of federal water projects.

Compact negotiations could also be accelerated to avoid the uncertainties associated with litigation that may affect a state's ability to manage its water. Such might be the case in South Dakota with the ETSI suit filed by the states of Missouri, Iowa, and Nebraska. As it is now, the lawsuit focuses on the processes by which the Department of the Interior approved the ETSI water contract and the Corps of Engineers issued the permit for construction of the diversion facilities. As well, the suit focuses on the depleting effect of the ETSI contract and the nonpreferred use of water for the slurry transport of coal. It does not appear the U.S. Supreme Court will look favorably on this type of lawsuit since the threat of actual harm may be difficult to demonstrate. A court, however, could declare that important procedures were disregarded and require the Bureau and the Corps to make the process adequate. During 1977 the Bureau completed an EIS entitled, "Water for Energy-Missouri River Reservoirs," in which one million acre-feet per year was identified as being available for development by industrial

users under limited period contract from Oahe, Garrison, and Fort Peck reservoirs. At that time no noticeable objections were heard from the lower basin states regarding the marketing of this water.

Long-term Potential Actions to Resolve Conflict (after the year 2000)

Assuming the present "conflict" passes unresolved with little action and that water development continues in the future, the long-term conflict would arise when the lower basin states feel that harm to instream flow is imminent. This will probably occur after the year 2000. Based on this study's hydrologic analyses, that point would appear to be at or near the time when upper basin depletions exceed the 1975 level of development by 1.6 to 1.7 million acre-feet per year. This threshold level of development would only affect navigation during a prolonged drought.

Congressional allocation could occur at this time through redefinition of the O'Mahoney-Milliken Amendment or by one of several types of legislation: (1) authorization of single large project or projects; (2) revision of the Pick-Sloan Program authorization in an omnibus bill that includes the authorization of a very large project such as the High Plains diversion; or (3) a congressional directive to the states to negotiate a compact before considering project authorizations. The second and third actions would both require negotiations among the basin states. These negotiations may become an urgent matter in the future, and the states may take on rapid negotiations of a compact to achieve division of water and/or benefits so as to enhance the consideration of legislation by Congress.

An interstate lawsuit could have standing in the U.S. Supreme Court when the level of depletion reaches the "imminent harm" level or if the authorization of a single project or projects would clearly exceed the depletion threshold of 1.6 to 1.7 million acre-feet per year. This would be a major lawsuit and would require considerable effort by Montana to prove its existing water use claims and its need for additional water to meet future consumptive use requirements. The lawsuit would likely last several years and require a great expenditure of funds to cover legal, engineering, and other expenses.

RECOMMENDED STRATEGY FOR MONTANA

Strategy Overview

This study has documented the fact that the current situation in the Missouri River Basin is favorable to Montana. Considerable water is physically available on the main stem to meet the state's current needs and there are ample supplies to meet future requirements even at the high level of development. Additionally, because the O'Mahoney-Milliken Amendment provides a preference to upper basin development of consumptive use over lower basin navigation, Montana can enjoy the legal protection needed to develop its water at the high level.

However, within the lower basin there is concern over the potential lack of flows for navigation in the future. This uncertainty will continue to precipitate lower basin actions which are aimed at frustrating upper basin water development or instituting an interstate water allocation. Since the O'Mahoney-Milliken Amendment is the prime factor in protecting upper basin development, it is likely that it will be challenged.

While Montana may wish to maintain the status quo, the state will eventually be drawn into a challenge on the river. Therefore, Montana's posture should be one of defending the status quo against those who wish to change it. The strategy involves building up defenses, readying an offense, and providing sentinels to give advance warnings. The overview of this strategy is as follows:

(1) Montana should not precipitate any new Missouri River Basin allocation process but should rely upon the 1944 Flood Control Act for protection.

(2) Montana should monitor activities of the other basin states and Congress which would threaten the 1944 Flood Control Act and specifically the O'Mahoney-Milliken Amendment and be prepared to respond to those threats. Such threatening actions would probably be in the form of congressional legislation or a lawsuit.

(3) Montana should monitor water development in other states and congressional activity which might threaten Montana's future use of water and be prepared to respond to those actions.

(4) Montana should encourage a negotiated resolution of the Missouri Basin conflict and discourage any confrontational approaches.

(5) Montana should prepare for the eventuality of a new allocation among all the Missouri basin states and establish the strongest position possible to achieve an allocation which protects Montana's current uses and provides for future water needs.

(6) Montana should take steps to encourage the wise use and development of its water resources.

<u>Strategy Discussion</u>

The following discussion presents the actions needed to implement the strategy outlined above. The programs involve participation by the Montana legislature, the Montana congressional delegation, the Attorney General's office, and state agencies (primarily DNRC, but also the Departments of Fish, Wildlife, and Parks, Health and Environmental Sciences, and State Lands).

Strategy Component 1 Rely Upon the 1944 Flood Control Act. The only action necessary at present to implement this component of the strategy is to have the Attorney General and state water managers carefully review the legal opinion by Frank Trelease, Esq. found in Chapter. While additional research may be necessary, the state should rely upon the 1944 Flood Control Act and the O'Mahoney-Milliken Amendment as its first line of protection. Montana, like the other upper basin states, should insist that the 1944 Flood Control Act is an allocation.

Strategy Component 2 Monitor Activities Which Threaten the 1944 Flood Control Act and the O'Mahoney-Milliken Amendment. Montana should be alert for congressional actions that limit Montana's options, threaten to adversely define the O'Mahoney-Milliken Amendment, or alter the Act in any way. The Montana congressional delegation and its staff should continually brief the Governor and state water planning authorities on trends, congressional dialogue, and proposed legislation which might lead to a reinterpretation or redefinition of the Act and/or Amendment. Additionally, the state has a responsibility to keep the Montana delegation briefed on the potential for conflict, Montana's water policies and programs, and solutions to the interstate conflict.

Montana should inform its congressional delegation and national decision-makers on the economic and other benefits of upper basin water development versus the much lower benefits of navigation in the lower Missouri River Basin. Any attempts by the lower basin states to enhance the nature of navigation on the Missouri River should be opposed by the upper basin states.

On the other front, Montana should be prepared to participate in any lawsuit initiated by the downstream states that challenges our interpretation of the O'Mahoney-Milliken Amendment. The proposed working strategy would include establishing a contingency fund for the Attorney General to use in the event of such an interstate lawsuit. It is estimated that a $200,000 contingency fund should enable the Attorney General to begin participating in a lower basin versus upper basin lawsuit involving interpretation of the O'Mahoney-Milliken Amendment. The suggested funding level should provide for the filing of motions, for the preparation of briefs submitted either as intervenor or as a friend of the court, for setting forth the requirements for participation in a major lawsuit, and for developing tactics to put Montana in the best position to prove and protect its water claims. If Montana determines that the two recent lawsuits (filed by the lower basin states et al. against the Bureau of Reclamation and Corps of Engineers regarding the sale of the 50,000 acre-feet per year of water from Oahe Reservoir) could affect the 1944 Flood Control Act, the state may wish to intervene directly or as a friend of the court.

Strategy Component 3 Monitor Other Activities Which Threaten Montana's Water Development. Other activities may occur which threaten Montana's ability to develop its water. Lower basin states combined with other constituencies opposed to water development might frustrate federal funding of upper basin water projects. While Montana might be

able to develop its low level potential without federal funding, higher levels probably could not be reached without federal participation. Another approach of the lower basin states might be to seek a limitation on interbasin diversions. While specific actions to meet these contingencies cannot be proposed at this time, Montana can develop a means to quickly identify these threats early on and to respond appropriately.

It can reasonably be anticipated that the states of the Missouri River Basin will continue to seek congressional authorization and funding of water projects identified by the Pick-Sloan Missouri Basin Plan enacted under the 1944 Flood Control Act. Montana must diligently monitor and review all federal agency budget requests and congressional water project legislation related to the Missouri River Basin to ensure that they do not authorize and fund downstream projects that would impinge on Montana's future use of Missouri River waters.

The High Plains Project should be closely monitored by DNRC and the Montana congressional delegation since this project may limit future development of water in Montana as well as in the other Missouri River Basin States. Montana should encourage water conservation in the High Plains states as an alternative to transporting Missouri River water into this region. At some point, Montana must determine if it should act as an intervenor on the High Plains or any other diversion project.

<u>Strategy Component 4 Encourage Conflict Resolution</u>. This study has indicated that Montana and the upper basin states are in a strong position to protect their future water use options in the event of an interstate allocation conflict in the Missouri River Basin. Montana has several significant factors in its favor: (1) the O'Mahoney-Millikin Amendment of the 1944 Flood Control Act protects upstream development west of the 98th Meridian for consumptive uses over navigation; (2) Missouri River water could be used to obtain considerably higher economic benefits from consumptive use development in the upper basin than can be achieved with navigation in the lower basin; (3) about 50 percent of the Missouri River flow at Sioux City, Iowa, originates in Montana; and (4) in order to protect their federal reserved rights against the navigation servitude, the several Indian tribes within the Missouri River Basin would probably support consumptive water development over the maintenance of flows to maintain navigation.

Another significant issue is that the upper basin states have not developed the water projects guaranteed to them under the Pick-Sloan Plan of the 1944 Flood Control Act. The upper basin position has been eloquently repeated by Governor Janklow of South Dakota in his defense of the sale of 50,000 acre-feet per year from Oahe Reservoir in the Missouri. He has stated that South Dakota lost 559,000 acres of prime farm land by the construction in South Dakota of Oahe, Fort Randall, and Big Bend reservoirs, three of the main stem reservoirs authorized under the Pick-Sloan Plan. To date, very little of the water allocated to the upper basin states has been developed.

While this study has indicated Montana's strengths, it appears that the conflict between the upper and lower basins will not be resolved by rational arguments alone. All basin states have interests in the Missouri River and its tributaries. The differences among the basin states should be resolved among themselves without litigation or congressional action, but through discussions and negotiations. Unfortunately, litigation and congressional action have already been initiated by lower basin states based on their perception that upper basin states have or may restrict lower basin water uses. The Missouri Basin states should discuss their issues and concerns through the forum of the Missouri Basin States Association. They should share the same negotiation table just as they share the same river. Perhaps agreement cannot be reached through honest and forthright discussions but, at least at that point, litigation or congressional action would be based on meaningful differences rather than emotional contrivance.

<u>Strategy Component 5 Prepare for the Eventuality of a New Allocation</u>. Montana must ready her offensive and defensive positions for an eventual allocation of the water resources between the upper and lower basin and also among states in the upper basin. In essence, Montana must get its own house in order by solidifying its water rights claims to existing and future uses and by resolving the uncertainties with Indian and federal reserved water rights and the Yellowstone Compact. Among the important actions that must be pursued in order to prepare for an eventual allocation are the following:

a. Document Existing Water Rights and Uses. The ongoing statewide adjudication process is vital to quantifying Montana's claims for existing water use and to protecting the water rights and uses in the event of an interstate water allocation. Knowing the uses and water rights is also necessary to administer Montana's water allotment among water users within the state. The goal should be to achieve realistic preliminary decrees in the Missouri and the Yellowstone River basins as soon as possible, preferably within the next five years. To accomplish this goal, priority must be given to these two basins by accelerating the work of the water courts and DNRC, if possible within the framework of the existing program.

b. Quantification of Indian and federal reserved water rights in Montana. The 1979 Montana Legislature created the Reserved Water Rights Compact Commission as a part of the general adjudication program. The legislators recognized that the final adjudication would be incomplete without a quantification of Indian and federal reserved water rights. They also believed that the process of negotiation might be attractive to the Montana tribes as an alternative to litigation. The Compact Commission was therefore charged with the responsibility of concluding compacts for the equitable division and apportionment of water between the state and its people and the several Indian tribes and federal agencies claiming reserved water rights within the state. At the present time, the Commission is negotiating with tribes on five of the seven reservations and the U.S. Departments of the Interior, Agriculture, and Defense.

This study supports the mandate of the Compact Commission in quantifying Indian and federal reserved water rights and encourages the conclusion of compacts by the July 1, 1985 deadline. Negotiation of compacts with the tribes and federal agencies will complete the adjudication program and will save Montana, the federal government, and the tribes millions of dollars in litigation costs. It will also provide essential information on irrigable lands and on water available for future appropriation and development. Until a firm water supply can be guaranteed by resolving the reserved water rights, many types of water projects with large financial costs will not be built whether they are on a reservation, on federal land, or in private ownership. Montana will also be in a stronger position in compact negotiations among the Missouri River Basin states if its adjudication program is complete and the reserved right question is settled by negotiating compacts that are acceptable to all parties, including the Montana Legislature and United States Congress.

c. Resolve Yellowstone River Compact Issues. The Yellowstone Compact provides recognition of water rights prior to 1950, and an arithmetic formula for calculating the amount of water unappropriated after 1950 that is to be divided between Wyoming and Montana. This compact also provides a basis for apportioning the water at the state line between Montana and North Dakota.

Since the time the Compact was executed in 1950, there has been sufficient water in the four major tributaries (Clarks Fork, Tongue, Powder, and Big Horn) to adequately satisfy pre-1950 water rights and post-1950 development without resorting to the provisions of the Compact for administering the distribution and use of the water supply. Consequently, an administrative procedure has never been developed for this purpose and at the present time, the Compact Commission has not determined the specific quantity of water to which each state is entitled.

The circumstances at present are appreciably different from those that prevailed when the Compact was negotiated. In 1950, concerns were primarily agricultural in nature. Today, agriculture, energy developers, Indian tribes, municipalities, the federal government, and states outside the basin are competing for water in the Yellowstone River Basin. It is now important that Montana join with Wyoming to develop an accounting system with forecasting capability which will allow the Compact Commission to administer the Compact on an equitable and regular basis. Included in the accomplishment of this task is determining the quantity of water available to Montana and Wyoming under the terms of the Compact. Major water developments may not occur on the tributaries unless these uncertainties are resolved.

Other interstate issues in the Yellowstone River Basin which should be resolved to allow for future water development include: (1) the Indian reserved water rights of the Crow and Northern Cheyenne tribes and their effects on the Compact allocation; (2) the

unresolved apportionment on the Little Bighorn River between Montana, Wyoming, and the Crow tribe; (3) the possibility that Wyoming's allocated share may be diverted from the Yellowstone main stem in Montana and transported back into Wyoming; and (4) the ongoing litigation regarding Article X of the Compact. Article X requires the unanimous approval of Montana, Wyoming, and North Dakota before Yellowstone River water can be diverted and transported outside the basin.

d. Develop a centralized water resource data management system. The state needs to develop such a system to manage the state's water resources more efficiently, specifically identifying water resources, existing uses, and the potential for future development. Until the statewide adjudication program is completed, the identification of existing uses and future development potential is Montana's only line of defense to obtain a fair share in any interstate allocation.

Many state and federal agencies are responsible for certain aspects of water resource management in Montana. In order to make their specific decisions, each agency collects the necessary data which are stored in separate agency files and, in many cases, are difficult to relocate. At the present time much of the water resource data is fragmented, neither indexed nor inventoried, not recorded in a standard format, and most importantly, not readily accessible to those who need the information for making management decisions.

The state needs to develop a water resource data management system that has five primary objectives: (1) to inventory and index the location of all pertinent water resource data; (2) to assess the accuracy and completeness of existing data (remove all duplication); (3) to standardize data collection procedures; (4) to develop and implement a centralized data system that is easily accessible in a useable format to all users; and (5) to establish a continuous and integrated water resource data collection and management program.

Through the National Water Use Data System (NWUDS) of the U.S. Geological Survey (USGS), DNRC, in conjunction with other water resource management agencies and the university system began designing a centralized water use data management system for Montana in 1980. However, funding for the NWUDS program has recently been cut by the federal government and the program is destined for extinction. The development of a centralized water resource data management system should be encouraged because the best water resource management decisions can only be made with the most accurate and updated information available. Particularly relevant is the collection of accurate information on water use and the potential for future development to justify Montana's allocation under compact negotiations among the Missouri River Basin states.

e. Plan and establish future claims to water. In Chapter VI the legal criteria for establishing claims for future water use are discussed. The methodologies range from an inventory of potential projects (the least effective method) to conditional permits or "inchoate rights" (the most effective). Since it will take some time to develop vested water rights ("inchoate rights") for claims to future use, Montana must demonstrate that it has both the potential for substantial additional development and the intent to diligently pursue that development. While the 1944 Flood Control Act provides Montana with abundant water supplies that are protected from downstream navigation claims, non-use of this water and lack of diligence in putting water to use would add weight to the argument that the act should be changed. Consequently, it is recommended that a process, not unlike the Yellowstone Reservation process, be undertaken for the Missouri River Basin in Montana. The steps required for such a process in the Missouri River Basin should include: (1) identification of water resources, (2) identification of potential uses, (3) input from other agencies and interested water users, (4) preparation of environmental impact analyses, (5) public hearings, and (6) consideration and order by the Board of Natural Resources and Conservation or adoption by the Montana Legislature. Special legislation would be required to implement this process.

The first step in the process to establish claims for future water use is an inventory of water development potentials in the Missouri River Basin. This step has, to a large degree, been completed through the Upper Missouri Level B Study. The projects identified in that report, along with the USDA Upper Missouri Irrigation Study and others, need to be compiled and standardized into a single inventory.

Building on this base, the Water Development Program should provide a comprehensive determination of Montana's water development potential and need in the basin. Public review of this analysis would be sought to help ensure that all reasonable and legitimate projects would be included. The Board of Natural Resources and Conservation and the Montana Legislature, after a hearings process, would then designate quantities of water in the basin necessary for Montana's use. Any such legislative designation should, in turn, be strengthened by the financial incentives of the Water Development Program in order to assure that it is transformed into project construction. If a more formalized system of adopting these quantities of water is felt necessary, the process could be patterned after the Montana water reservation system. However, other options that would protect Montana's future use of water should also be considered.

This process, from water needs identification to actual water use, would be a distinct state program that clearly demonstrates Montana's confidence in the 1944 Flood Control Act and its commitment to develop Missouri Basin waters. Since the emphasis of the program is on establishing claims which can reasonably be put to

use, Montana will have strengthened its rights to future water use and will be in an enviable position to defend its water needs in an interstate water allocation.

f. Identify and resolve policies and issues. An advisory council such as the Water Policy Advisory Council should be created. This council should consist of state water leaders, legislators, water users, professional resource managers, and agency representatives who would review water issues and state policies periodically or as the need arises. The state may wish to use the existing, nine-member Water Development Advisory Committee which is responsible for advising DNRC on the water development applications which should be funded. The committee or council would develop recommendations about state water development in light of the interstate allocation requirements and the urgency indicated by potential conflicts.

Strategy Component 6 Develop Water Uses in Montana. One of the strategy elements is to encourage the development of Montana's water resources in a wise and efficient manner. However, encouragement is not enough. The state must accept the responsibility to put its water to beneficial use. Interstate lawsuits are generally considered the least desirable form of allocation; however, in those cases involving equitable apportionment, the courts have almost always been reluctant to deny established uses. Consequently, the best action to protect Montana's future options to Missouri River water is to identify feasible projects and then put the water to beneficial use.

The state needs to encourage and assist, both financially and technically, the development of needed projects. In doing so the state can promote projects and activities which meet goals identified by the state as important to its future prosperity and which otherwise may not be addressed. Such goals presently include: efficient use of natural resources including water, energy, land, and air; provision of water for the improvement of family farm operations; provision of such public benefits as recreation, flood control, erosion reduction, water quality enhancement, sediment reduction, and wildlife conservation; construction of multipurpose facilities; and water storage needed to capture early season flows. In providing these benefits, the state will play an active role in maintaining its renewable resources for the long-term benefit of its citizens. Some of the means to develop new uses include:

a. Promote Federal Water Projects. The State Water Conservation Board actively promoted many of the large federal projects which exist in Montana today. Canyon Ferry Dam, Yellowtail Dam, Hungry Horse Dam, Fort Peck Dam, Tiber Dam, and the Helena Valley and Huntley Projects all received active state support from the early planning stages to actual construction. Many of these projects were authorized under the Pick-Sloan Plan of the 1944 Flood Control Act. However, Montana has not developed water to its fullest extent in these storage projects nor has the state developed new projects under this plan since the mid-1950's. In contrast,

South Dakota and North Dakota have been and are still actively seeking Pick-Sloan authorization and federal funding for water projects in their respective states. Montana should make a concerted effort to identify those projects that qualify under the Pick-Sloan Plan and then prioritize them. The state, with the unified assistance of the Montana congressional delegation and the Bureau of Reclamation and other federal agencies, should then seek federal authorization and funding. The state should cooperate with the federal agencies in the feasibility and design studies. The federal government, primarily the Bureau of Reclamation, should have the major responsibility for construction, operation, and maintenance of the facilities.

b. Perfect Water Reservations. It is critically important that the water reserved under the Yellowstone reservation process be developed within a reasonable time frame and that the reservants adhere to the schedule stipulated by the Board of Natural Resources and Conservation in the Reservation Order. This process must be able to withstand an equitable apportionment lawsuit among the Missouri Basin states. The Montana legislature realized this and allocated funds for administrative and technical assistance to the Yellowstone conservation districts in developing their reservations. The state should continue to closely monitor the development of these reservations to assure compliance with the Board reservation order. If the need arises, the state legislature may need to provide funding for additional technical and financial assistance to fully develop the conservation district reservations.

c. Develop state water projects. Since the early 1930's the State of Montana has been actively involved at some level with the promotion and construction of water development projects. In a special legislative session convened in 1934, the state legislature established the State Water Conservation Board and charged it with the responsibility to coordinate the construction of water projects necessary to supply water to Montana's agricultural lands. This board, with the aid of federal funds, developed 181 water projects around the state at a cost of over $22 million. These projects, many of which are still being used today, established over 815 miles of canals and irrigated 400,000 acres of cropland.

Since the initial push for development in the 1930's and 1940's, Montana's financial involvement in water projects has been minor because the federal programs have provided considerable amounts of funding for both small and large projects within the state. Now the trend of reduced federal funding is placing a greater proportion of the financial burden upon the state. Therefore, the state should again consider accepting the responsibility of building new water projects. However, the state should concentrate on only those projects that will provide the greatest economic and environmental advantages to Montana.

d. Assist Indian Water Development. The state should encourage the development of joint state-Indian water projects as a means

to resolve Indian reserved water right conflicts. For example, a compact between the Northern Cheyenne tribe and the Reserved Water Rights Compact Commission representing the State of Montana will more than likely hinge upon the construction of an enlarged Tongue River Reservoir, which could provide enough water to satisfy both the tribe and the State of Montana. Specifically the tribe needs water to satisfy the reserved water rights on the Reservation. The state desires a safe dam in place of the existing hazardous structure, enough water to supply the Tongue River irrigators and, like the tribe, enough water to resolve the state-Indian water rights conflict. Both the state and tribes realize that resolution of the water right issues will firm up the water supply available for future development both on and off the reservation and can only expedite and enhance a state water development program. The state is encouraged to consider the need for joint Indian-State water projects as a catalyst for the quantification and resolution of Indian reserved water rights on the seven reservations in Montana.

e. Assist Private Water Development. An important component of a comprehensive water development program is to encourage and assist private sector projects and activities. The types of undertakings involved are diverse and range from planning/feasibility studies to construction and rehabilitation of rural water development systems to streambank stabilization, erosion control, canal lining, and water storage. Although needed throughout the state, development of these types of projects is not proceeding because of high costs and limited payback potential. Projects such as these need to be carefully evaluated on a case-by-case basis to determine whether technical or financial assistance is appropriate. Funding needed to promote appropriate water development by the private sector could come from a number of sources; the most likely would be the Montana Water Development Program.

If Montana is to realize a pervasive water development program, such as that outlined above, important consideration must be given to the means of financing such an effort, since federal funding for water projects has been greatly reduced. For example, the Land and Water Conservation Fund which used to make three million dollars available each year in Montana for water projects has been cut to zero; the Soil Conservation Service PL 556 program used to provide ten million dollars a year, but no new projects have been approved in the past two years; the U.S. Bureau of Reclamation's small projects loan program which provided low interest loans for irrigation projects has seen all its approved projects shelved for the past two years; the Farmer's Home Administration has $312.4 million available this year -one-half of its normal allotments; and the Old West Regional Commission which provided planning funds for water projects is now defunct.

The 1981 Montana Legislature created a water development fund which contains a $250 million bonding authority. However, because of the projected federal cut backs in water development, this program may not provide enough funding to develop Montana's water resources and to put the

state into a desirable position before compact negotiations begin in the Missouri River Basin. The state needs to evaluate other sources of revenue; four possibilities are discussed below.

a. Water marketing. The state should evaluate instate and out-of-state marketing of limited amounts of water from existing state and federal reservoirs and from proposed reservoirs with water reservations (Bureau of Reclamation and DNRC in the Yellowstone River Basin) as a means to assist in the financing of future water projects. It is recommended that the state determine the economic, tax, administrative, legal, social, and environmental advantages and disadvantages of water marketing before making a final decision. The cost of the study is estimated to be $75,000.

It appears that approximately one million acre-feet per year of stored water may be available to Montana for multiple purposes in the Missouri and Yellowstone River basins. In the Yellowstone River Basin, as much as 500,000 acre-feet per year may be available from Yellowtail Reservoir and possibly 20,000 acre-feet per year in the proposed enlargement of the Tongue River Reservoir. The DNRC is evaluating industrial water marketing as a means of paying for the Tongue River project and thereby continue to supply water to the Tongue River irrigators and to resolve the reserved water rights on the Northern Cheyenne Reservation. Also, through the Yellowstone Reservation process, a firm supply of 200,000 to 300,000 acre-feet per year could be available for industrial, agricultural, municipal, and recreational uses in off-stream storage projects. In the Missouri River Basin, 300,000 acre-feet per year of stored water in Fort Peck Reservoir has been designated for industrial marketing by the Bureau of Reclamation. The DNRC has a contract with the Bureau which allows the Department first option to market this amount of water. At the present time, DNRC has not been able to market any of the water from Fort Peck Reservoir.

The large industrial demand for water that was experienced in the early 1970's has diminished considerably in Montana. For example, at the time the Bureau of Reclamation had signed option contracts with industrial users for 623,000 acre-feet per year from Yellowtail Reservoir. All of the option contracts have now been dropped and, according to the Bureau, there is little or no demand for industrial water from Yellowtail Reservoir at this time. An exception, however, appears to be the demand for water for coal slurry pipelines. The state may wish to evaluate marketing a limited amount of stored water from existing state and federal reserves for slurry purposes. Coal slurry may prove attractive because the amount of water required to transport a ton of coal from Montana is 5 to 7 times less than the amount needed to convert the coal in Montana for out-of-state energy needs. If coal can be supplied cheaper to energy customers in other states by slurry pipelines than by railroads, the demand for Montana coal will probably increase. This may cause an increase in coal mining activity in Montana which in turn may have detrimental environmental impacts.

b. Hydropower development on federally-owned facilities. The state should explore the possibility of joint local-state-federal development of hydropower on such federally-owned facilities as Yellowtail Afterbay Dam. In a joint venture, the local and state participants could finance their portion of the cost through the Water Development Program and the Bureau of Reclamation would obtain authorization and funding through Congress. The state would earmark its revenues for other water development projects and activities in the state. The Bureau of Reclamation could conduct the feasibility and design studies, construct the projects and operate the facility after completion.

c. Hydropower development on state-owned projects. The state has a process for developing hydropower on state-owned facilities and for earmarking the revenues for water development, specifically for the rehabilitation of existing state projects. It is recommended that the state continue to pursue hydropower development on its projects as a means to generate revenues for repairing and maintaining deteriorating state-owned projects. This mechanism will assure that Montana can continue to put water from its existing state-owned projects to beneficial use.

d. Increase use of coal severance tax. The state may wish to evaluate the use of more of the coal severance revenues to fund certain types of water development. Because of federal cutbacks in water development, selective development of Montana's water, which is a renewable resource, can only help Montana's economy.

COST OF STRATEGY IMPLEMENTATION

An integral part of the strategy to achieve an interstate water allocation favorable to Montana is to fund the programs necessary to establish and perfect the state's water claims. A five-year budget has been estimated in tabular form with line items indicated for each of the work strategy methods described herein. These costs are in addition to ongoing programs.

Table VII-1 gives the estimated funding requirements calculated at the 1982 level of costs. It should be pointed out that such costs of project implementation as feasibility/pre-feasibility studies, geotechnical investigations, final engineering designs, project management, construction inspection, and administrative and legal costs are not included. Such costs would be defined and provided for in the legislative project authorizations and the Montana Water Development Program.

TABLE VII-1. A FIVE-YEAR AGENCY BUDGET FOR A MONTANA INTERSTATE ALLOCATION OF MISSOURI RIVER WATER

Item	$1000 Per Year[1]					
	1984	1985	1986	1987	1988	5-Year TOTAL
Industrial Water Marketing Study	75					75
Process for Designating Missouri River Water for Future Use	100	100	100	150	150	600
Resolve Yellowstone River Compact Issues	50	50	50	50		200
Water Resources Data Management	50	50	50	50	50	250
Legal Assistance (Contingency)	200					200
TOTALS	475	200	200	250	200	1,325

[1] All expenditures are shown in 1982 dollars.

About one million dollars of expenditures are identified over a five-year period to help ensure that Montana receives an equitable share of water in the Missouri River Basin. This is a small price to pay for the economic benefits derived from water development in Montana. For example, at just the low level of projected development, an estimate of an additional $31.9 million per year of gross crop values from new irrigated lands can accrue to the state by the year 2000, and energy/coal development can generate $269.9 million per year by the year 2000. Clearly, the projected costs of establishing Montana's claim to water will be offset by the ultimate economic benefits to the state.

CONCLUSIONS

The purpose of this study was to identity the potential conflicts in water usage in the Missouri River Basin, quantify those conflicts, estimate the time when such events will occur, and propose a strategy for Montana to use in the resolution of those conflicts. This study has documented that there is a potential conflict between navigation in the lower basin and consumptive use development in the upper basin. Montana is currently in a position of having several significant factors in its favor. Among them is the fact that the O'Mahoney-Milliken Amendment to the Flood Control Act of 1944 assures that water will be available for consumptive uses west of the 98th Meridian. Additionally, a preliminary analysis of future economic benefits which would accrue from future uses of basin water showed that the highest economic return will be realized through upper basin water use. These points underscore the fact that the best position for Montana would be for the state to continue to develop its water. However, Montana also realizes the need to protect her instream flows, which benefit downstream states, such as the 5.5 million acre-feet per year reserved in the Yellowstone River at the Montana North Dakota border. In any event, if the upper basin states continue to develop water, a conflict will eventually develop between the upper and lower basin states since navigational and other instream uses downstream are currently benefiting from the surplus water flows. Social and economic disruption will occur if the depletions in the upper basin increase and flows decrease beyond a threshold level in the lower basin. Therefore, the conflict must be resolved, probably through one of the three forms of legal water allocation. This study has indicated only a limited number of actions that might be taken to resolve the conflict. However, the components of the strategy should provide the broad base upon which to build a defense against the many varied challenges to Montana's claim to water in the Missouri River Basin.

LIST OF SELECTED REFERENCES, CHAPTER VII

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APPENDIX

TABLE A-1. SUMMARY BY STATE OF IRRIGATION PROJECTS PROPOSED IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," MAY 5, 1944.

STATE		YELLOWSTONE	MISSOURI RIVER BASIN SUBDIVISIONS: UPPER MISSOURI	MINOR TRIBUTARIES	NIOBRARA, PLATTE, KANSAS	FT. PECK TO SIOUX CITY	TOTAL
Montana	New	227,230	460,900	7,500		271,500	967,130
	Supp.	37,100	208,700	0		0	245,800
	Total	264,330	669,600	7,500		271,500	1,212,930
Wyoming	New	280,060		1,500			281,560
	Supp.	167,400		0			167,400
	Total	447,460		1,500			448,960
North Dakota	New	2,270		47,470		1,216,700	1,266,440
	Supp.	0		0		0	0
	Total	2,270		47,470		1,216,700	1,266,440
South Dakota	New			156,510		804,700	961,210
	Supp.			11,300		0	11,300
	Total			167,810		804,700	972,510
Nebraska	New				989,445		989,445
	Supp.				19,930		19,930
	Total				1,009,375		1,009,375
Colorado	New				101,280		101,280
	Supp.				1,719		1,719
	Total				102,999		102,999
Kansas	New				193,335		193,335
	Supp.				155		155
	Total				193,490		193,490
TOTALS	New	509,560	460,900	212,980	1,284,060	2,292,900	4,760,400
	Supp.	204,500	208,700	11,300	21,804	0	446,304
	Total	714,060	669,600	224,280	1,305,864	2,292,900	5,206,704

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
MONTANA			
YELLOWSTONE SUBDIVISION			
YELLOWSTONE RIVER-MAIN STEM			
Mission Ditch	1,280	0	1,280
Greycliff	350	0	350
Cove Canal Extension	2,460	0	2,460
Huntley Extension	2,960	0	2,960
Seven Mile Flat	7,500	0	7,500
North Custer	3,750	0	3,750
Hysham	7,310	0	7,310
Antelope Flate	14,600	0	14,600
North Sanders	1,470	0	1,470
Orinoco	1,600	0	1,600
Chimney Rock	3,650	0	3,650
Highland Park	10,470	0	10,470
Hathaway	1,770	0	1,770
Fort Koegh	3,120	0	3,120
Saugus-Calypso	2,470	0	2,470
Buffalo Rapids, Third Division	13,440	0	13,440
Cracker Box	800	0	800
Colgate	1,300	0	1,300
Stipek	4,800	0	4,800
Intake	840	0	840
Savage	2,390	0	2,390
Elm Coulee	1,800	0	1,800
Seven Sisters	1,800	0	1,800
Sidney Extension	1,100	0	1,100
SUBTOTAL	93,030	0	93,030
BIG HORN RIVER BASIN			
Hardin	45,000	1,800	46,800
Little Horn	0	14,800	14,800
Custer Bench	11,400	0	11,400
Wyola	3,600	0	3,600
Benteen Flat	1,600	0	1,600
Battlefield	1,200	0	1,200
Crow	1,200	0	1,200
SUBTOTAL	64,000	16,600	80,600

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
MONTANA			
YELLOWSTONE SUBDIVISION			
CLARKS FORK BASIN			
Whitehorse Bench	1,500	0	1,500
SUBTOTAL	1,500	0	1,500
TONGUE RIVER BASIN			
Tongue River Pumping	26,100	0	26,100
SUBTOTAL	26,100	0	26,100
POWDER RIVER BASIN			
Moorhead	42,600	0	42,600
SUBTOTAL	42,600	0	42,600
MISCELLANEOUS			
Shields River	0	8,400	8,400
Sweetgrass	0	12,100	12,100
SUBTOTAL	0	20,500	20,500
YELLOWSTONE SUBDIVISION TOTAL	227,230	37,100	264,330
UPPER MISSOURI SUBDIVISION			
UPPER MISSOURI BASIN			
Red Rock	1,000	5,600	6,600
Horse Prairie	1,300	10,700	12,000
Dillon Valley	30,100	17,900	48,000
Ruby	4,000	5,700	9,700
Big Hole	0	1,000	1,000
Jefferson	9,400	2,500	11,900
Boulder	0	5,700	5,700
Three Forks	150,700	137,100	287,800
Broadwater Missouri	7,100	0	7,100
Clarkston Pumping	2,100	0	2,100
Helena Valley Pumping	15,800	5,300	21,100
Rock Creek	1,000	200	1,200
Nilan	400	6,800	7,200

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
MONTANA			
UPPER MISSOURI SUBDIVISION			
UPPER MISSOURI BASIN			
Chestnut Valley Extension	6,000	0	6,000
Ulm Valley Pumping	4,300	0	4,300
Great Falls Pumping	14,400	0	14,400
Newland	3,900	0	3,900
Sun River Project Extension	32,700	0	32,700
Stanford	1,200	0	1,200
Hobson	0	6,000	6,000
Ross Fork	3,000	0	3,000
Hanover	0	700	700
Lewistown	4,000	0	4,000
Lower Marias	120,000	0	120,000
Saco Divide	9,400	0	9,400
Dodson Pumping	1,500	0	1,500
Teton Slope	37,600	3,500	41,100
SUBTOTAL	460,900	208,700	669,600
UPPER MISSOURI SUBDIVISION TOTAL	460,900	208,700	669,600
MINOR TRIBUTARIES SUBDIVISION			
LITTLE MISSOURI BASIN			
Little Missouri	7,500	0	7,500
MINOR TRIBUTARIES SUBDIVISION TOTAL	7,500	0	7,500
FORT PECK TO SIOUX CITY SUBDIVISION			
MIDDLE MISSOURI RIVER BASIN			
Missouri-Souris:			
Glasgow Bench	59,400	0	59,400
Missouri River Pumping	34,880	0	34,880
Northern Division:			
Crosby-Mohall	177,224	0	177,224
SUBTOTAL	271,504	0	271,504
FORT PECK TO SIOUX CITY SUBDIVISION TOTAL	271,504	0	271,504
MONTANA TOTAL	967,134	245,800	1,212,934

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
WYOMING			
YELLOWSTONE SUBDIVISION			
BIG HORN RIVER BASIN			
Fremont	56,000	0	56,000
Little Wind River	0	34,000	34,000
Popo Agie River	0	14,700	14,700
Hudson Bench	5,700	0	5,700
Shoshoni	16,600	0	16,600
Badwater	1,100	2,700	3,800
Shoshone Project Extension	76,100	5,200	81,300
Owl Creek	0	14,400	14,400
Paintrock	2,700	6,000	8,700
Shell Creek	0	10,200	10,200
Big Horn Pumping	20,000	0	20,000
SUBTOTAL	178,200	87,200	265,400
TONGUE RIVER BASIN			
Sheridan Canal	0	38,000	38,000
SUBTOTAL	0	38,000	38,000
POWDER RIVER BASIN			
Piney	0	9,600	9,600
Buffalo	0	10,400	10,400
Crazy Woman	9,400	6,900	16,300
French Creek	0	3,850	3,850
Kaycee	10,400	6,400	16,800
Arvada	17,700	0	17,700
Ucross	6,860	5,050	11,910
SUBTOTAL	44,360	42,200	86,560
MISCELLANEOUS			
Riverton Extension	57,500	0	57,500
SUBTOTAL	57,500	0	57,500
YELLOWSTONE SUBDIVISION TOTAL	280,060	167,400	447,460

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
WYOMING			
MINOR TRIBUTARIES SUBDIVISION			
LITTLE MISSOURI BASIN			
Little Missouri	1,500	0	1,500
MINOR TRIBUTARIES SUBDIVISION TOTAL	1,500	0	1,500
NIOBRARA, PLATTE, AND KANSAS SUBDIVISION TOTAL	0	0	0
WYOMING TOTAL	281,560	167,400	448,960

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
NORTH DAKOTA			
YELLOWSTONE SUBDIVISION			
YELLOWSTONE RIVER-MAIN STEM			
Sidney Extension	1,350	0	1,350
Cartwright	920	0	920
SUBTOTAL	2,270	0	2,270
YELLOWSTONE SUBDIVISION TOTAL	2,270	0	2,270
MINOR TRIBUTARIES SUBDIVISION			
WESTERN TRIBUTARY BASIN			
Knife River	15,400	0	15,400
Heart River	14,320	0	14,320
Cannonball	17,750	0	17,750
SUBTOTAL	47,470	0	47,470
MINOR TRIBUTARIES SUBDIVISION TOTAL	47,470	0	47,470
FORT PECK TO SIOUX CITY SUBDIVISION			
MIDDLE MISSOURI BASIN			
Missouri River Pumping	34,020	0	34,020
Northern Division:			
Crosby-Mohall	989,376	0	989,376
New Rockford	55,500	0	55,500
Jamestown	22,100	0	22,100
Oakes	31,000	0	31,000
North Dakota Pumping	84,700	0	84,700
SUBTOTAL	1,216,696	0	1,216,696
FORT PECK TO SIOUX CITY SUBDIVISION TOTAL	1,216,696	0	1,216,696
NORTH DAKOTA TOTAL	1,266,436	0	1,266,436

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
SOUTH DAKOTA			
MINOR TRIBUTARIES			
WESTERN TRIBUTARY BASIN			
Grand River	28,500	0	28,500
Moreau River	27,150	0	27,150
Cheyenne River	46,560	0	46,560
Edgemont	8,000	0	8,000
Belle Fourche	0	11,300	11,300
Bad River	4,300	0	4,300
White River	42,000	0	42,000
SUBTOTAL	156,510	11,300	167,810
MINOR TRIBUTARIES SUBDIVISION TOTAL	156,510	11,300	167,810
FORT PECK TO SIOUX CITY SUBDIVISION			
MIDDLE MISSOURI BASIN			
South Dakota Pumping	54,700	0	54,700
Oahe	750,000	0	750,000
SUBTOTAL	804,700	0	804,700
FORT PECK TO SIOUX CITY SUBDIVISION TOTAL	804,700	0	804,700
SOUTH DAKOTA TOTAL	961,210	11,300	972,510

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
NEBRASKA			
NIOBRARA, PLATTE, KANSAS SUBDIVISION			
PLATTE RIVER BASIN			
Sargent	25,000	0	25,000
Farwell	15,000	0	15,000
Lower North Loup	15,000	0	15,000
Cedar Rapids	20,000	0	20,000
Albion	10,000	0	10,000
Loup Valley	100,000	0	100,000
Plum Creek	215,000	0	215,000
Grand Island	100,000	0	100,000
Prairie Creek	80,000	0	80,000
Osceola	120,000	0	120,000
Bellwood	80,000	0	80,000
Schuyler	120,000	0	120,000
SUBTOTAL	900,000	0	900,000
KANSAS RIVER BASIN			
North Republican	800	2,140	2,940
Wells	15,700	0	15,700
Frenchman	3,330	11,145	14,475
Meeker	4,180	3,820	8,000
Red Willow	12,880	990	13,870
Cambridge	15,740	1,060	16,800
Oxford	4,680	100	4,780
Franklin	6,840	180	7,020
Red Cloud	6,155	95	6,250
Superior, Courtland	19,140	400	19,540
SUBTOTAL	89,445	19,930	109,375
NIOBRARA, PLATTE, KANSAS SUBDIVISION TOTAL	989,445	19,930	1,009,375
NEBRASKA TOTAL	989,445	19,930	1,009,375

TABLE A-2. IRRIGATION PROJECTS IN U.S. SENATE DOCUMENT 191, 78th CONGRESS, "CONSERVATION, CONTROL, AND USE OF WATER RESOURCES OF THE MISSOURI RIVER BASIN," May 5, 1944. (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
COLORADO			
NIOBRARA, PLATTE, KANSAS SUBDIVISION			
PLATTE RIVER BASIN			
Narrows	100,000	0	100,000
SUBTOTAL	100,000	0	100,000
KANSAS RIVER BASIN			
North Republican	1,280	1,200	2,480
St. Francis	0	519	519
SUBTOTAL	1,280	1,719	2,999
NIOBRARA, PLATTE, KANSAS SUBDIVISION TOTAL	101,280	1,719	102,999
COLORADO TOTAL	101,280	1,719	102,999
KANSAS			
NIOBRARA, PLATTE, KANSAS SUBDIVISION			
KANSAS RIVER BASIN			
St. Francis	6,000	0	6,000
Wells	7,800	0	7,800
Almena	4,500	0	4,500
Superior, Courtland	34,060	0	34,060
Republic	10,275	155	10,430
Scandia	12,700	0	12,700
Kirwin	11,000	0	11,000
Webster	10,000	0	10,000
Glen Elder	26,000	0	26,000
Wilson	18,000	0	18,000
Cedar Bluffs	13,000	0	13,000
Kanopolis	40,000	0	40,000
SUBTOTAL	193,335	155	193,490
NIOBRARA, PLATTE, KANSAS SUBDIVISION TOTAL	193,335	155	193,490
KANSAS TOTAL	193,335	155	193,490

TABLE A-3 SUMMARY OF TABLE A-4: IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS WITHIN THE MISSOURI RIVER BASIN

		MISSOURI RIVER SUBBASINS							
State		Yellowstone	Upper Missouri (Montana)	Eastern Dakota Trib.	Niobrara Platte	Middle Missouri Trib.	Kansas River	Lower Missouri Trib.	Total
Montana	New	359,000	302,531						661,531
	Supp	0	191,469						191,469
	Total	359,000	494,000						853,000
Wyoming	New	190,407			15,000				205,407
	Supp	52,393			0				52,393
	Total	242,800			15,000				257,800
North Dakota	New			1,236,000					1,236,000
	Supp			0					0
	Total			1,236,000					1,236,000
South Dakota	New			924,700					924,700
	Supp			0					0
	Total			924,700					924,700
Nebraska	New				2,683,338		720,000		3,403,338
	Supp				11,662		0		11,662
	Total				2,695,000		720,000		3,415,000
Colorado	New				0		125,000		125,000
	Supp				287,000		0		287,000
	Total				287,000		125,000		412,000
Kansas	New					207,000	1,198,000		1,405,000
	Supp					0	0		0
	Total					207,000	1,198,000		1,405,000
Iowa (& Minnesota)	New					278,000		690,000	968,000
	Supp					0		0	0
	Total					278,000		690,000	968,000
Missouri	New							610,000	610,000
	Supp							0	0
	Total							610,000	610,000
TOTAL	New	549,407	302,531	2,160,700	2,698,338	485,000	2,043,000	1,300,000	9,538,976
	Supp	52,393	191,469	0	298,662	0	0	0	542,524
	Total	601,800	494,000	2,160,700	2,997,000	485,000	2,043,000	1,300,000	10,081,500

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN

Irrigation Project	New Land	Supplemental Water	Total Area
MONTANA			
YELLOWSTONE SUBBASIN			
YELLOWSTONE RIVER-MAIN STEM[a]			
Park Conservation District (C.D.)	21,644	0	21,644
Sweetgrass C.D.	15,313	0	15,313
Stillwater C.D.	5,290	0	5,290
Carbon C.D.	630	0	630
Dept. of State Lands	4,063	0	4,063
Yellowstone C.D.	24,835	0	24,835
Dept. of State Lands	2,991	0	2,991
U.S. B.L.M.	360	0	360
Treasure C.D.	7,035	0	7,035
Dept. of State Lands	3,405	0	3,405
Rosebud C.D.	34,525	0	34,525
N. Custer C.D.	2,070	0	2,070
N. Custer C.D. (Kinsey)	5,370	0	5,370
Prairie Co. C.D.	5,162	0	5,162
Dept. of State Lands	720	0	720
Prairie Co. C.D. (Lower)	17,079	0	17,079
Dawson Co. C.D.	18,127	0	18,127
Richland Co. C.D.	21,710	0	21,710
Buffalo Rapids C.D.	3,100	0	3,100
Little Beaver C.D.	6,650	0	6,650
Dept. of State Lands	7,638	0	7,638
U.S. B.L.M.	10,370	0	10,370
YELLOWSTONE RIVER-MAIN STEM SUBTOTAL	218,087	0	218,087
BIG HORN RIVER BASIN			
Big Horn C.D.	9,175	0	9,175
Dept. of State Lands	850	0	850
BIG HORN RIVER BASIN SUBTOTAL	10,025	0	10,025
CLARK'S FORK BASIN			
Carbon C.D.	9,404	0	9,404
Dept. of State Lands	897	0	897
CLARK'S FORK BASIN SUBTOTAL	10,301	0	10,301

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
MONTANA			
YELLOWSTONE SUBBASIN			
TONGUE RIVER BASIN			
Rosebud C.D.	2,835	0	2,835
Big Horn C.D.	470	0	470
N. Custer C.D.	4,605	0	4,605
Dept. of State Lands	895	0	895
TONGUE RIVER BASIN SUBTOTAL	8,805	0	8,805
POWDER RIVER BASIN			
Prairie C.D.	295	0	295
Powder River C.D.	9,120	0	9,120
N. Custer C.D.	6,765	0	6,765
Dept. of State Lands	2,443	0	2,443
POWDER RIVER BASIN SUBTOTAL	18,623	0	18,623
PRIVATE PROJECTS SUBTOTAL	93,159	0	93,159
YELLOWSTONE SUBBASIN TOTAL	359,000	0	359,000
UPPER MISSOURI SUBBASIN[b,c,d]			
UPPER MISSOURI BASIN			
Gallatin Unit	7,957	51,139	59,096
Clarkston Unit	985	0	985
Chestnut Valley	4,470	1,890	6,360
Lower Marias	127,000	0	127,000
Milk River Supp.	0	108,140	108,140
Boulder River W.S.	3,400	7,300	10,700
Fort Benton Unit	8,700	0	8,700
East Central C.D.[c]	94,000	0	94,000
Private Projects	34,019	23,000	57,019
UPPER MISSOURI BASIN SUBTOTAL	280,531	191,469	472,000
FORT PECK TO STATE LINE BASIN[b]			
Bonanza Unit	800	0	800
Fort Charles Unit	3,187	0	3,187
Calais Unit	6,410	0	6,140
Diamond Ranch Unit	900	0	900

(Continued)

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
MONTANA			
UPPER MISSOURI SUBBASIN			
FORT PECK TO STATE LINE BASIN[b]			
Farmer Cr. Unit	888	0	888
Popular Unit	4,400	0	4,400
Wapiti Unit	3,739	0	3,739
Private Projects	1,676	0	1,676
FORT PECK TO STATE LINE SUBBASIN SUBTOTAL	22,000	0	22,000
UPPER MISSOURI SUBBASIN TOTAL	302,531	191,469	494,000
YELLOWSTONE SUBBASIN TOTAL	359,000	0	359,000
MONTANA TOTAL	661,531	191,469	853,000

[1]Source Documents:

[a]Montana Board of Natural Resources and Conservation, December 15, 1978, Order of the Board of Natural Resources Establishing Water Reservations (Yellowstone River Basin). See also Missouri River Basin Commission, March 1978, Yellowstone Basin and Adjacent Coal Area, Level B Study, Volume 1-8.

[b]Missouri River Basin Commission, March 1981, Upper Missouri River Basin, Level B Study Report and Environmental Impact Statements.

[c]Identified by East Central C.D. for water rights reservation purposes. Acreage identified by North-Central C.D. covered in Level B list.

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
WYOMING			
YELLOWSTONE SUBBASIN			
BIG HORN RIVER BASIN			
Banjo Flats	10,400	0	10,400
Bighorn Unit	1,730	0	1,730
Buffalo Bill Enl.	20,470+	9,000	29,470+
Cody Canal Rehab.	2,000	0	2,000
Cody Pump Area	510	0	510
Crooked Creek W.S.	250	1,150	1,400
Goosberry Cr. W.S.	0	2,610	2,610
Greybull Flat	980	0	980
Lakeview Canal	0	9,000	9,000
Nowood River	2,270	0	2,270
Sage Cr.-Prior Mtn.	0	4,000	4,000
Lower Shell Creek	0	1,880	1,880
Shoshone N. Ext.	19,750	0	19,750
Shoshone S. Ext.	17,270	0	17,270
Shoshone S. Add.	3,250	0	3,250
Westside Irrigation Project	25,000	0	25,000
BIG HORN SUBTOTAL	103,880	27,640	131,520
WIND RIVER BASIN			
Upper Bad Water Cr.	0	1,700	1,700
Upper Beaver Creek	1,587	1,213	2,800
Crow Creek Project	2,600	1,200	3,800
Green Valley Rnches	5,100	0	5,100
Hidden Valley	0	2,362	2,362
Kirby Draw	11,200	0	11,200
Muddy Ridge	18,000	0	18,000
Mule Butte	17,280	0	17,280
N. Hudson	6,200	0	6,200
Preacher Draw-Beaver Creek	7,400	0	7,400
Sand Mesa	1,690	0	1,690
Taylor-Dutch Flat	1,000	0	1,000
Winchester	9,680	0	9,680
WIND RIVER SUBTOTAL	81,737	6,475	88,212
CLARK'S FORK BASIN			
Badger Basin	1,600	0	1,600
Cyclone Bar	3,190	2,076	5,266
CLARK'S FORK SUBTOTAL	4,790	2,076	6,866

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
WYOMING			
YELLOWSTONE SUBBASIN			
TONGUE RIVER BASIN			
S. Tongue-Prairie Dog	0	9,200	9,200
TONGUE RIVER SUBTOTAL	0	9,200	9,200
POWDER RIVER BASIN			
Middle Fork-Crazy Woman	0	3,000	3,000
Kaycee	0	4,000	4,000
N.E. Wyoming Water Project	N/A	N/A	N/A
POWDER RIVER SUBTOTAL	0	7,000	7,000
MISCELLANEOUS			
MISCELLANEOUS SUBTOTAL	0	0	0
YELLOWSTONE SUBBASIN TOTAL[a]	190,407	52,391	242,798
MIDDLE MISSOURI SUBBASIN TOTAL	0	0	0
NIOBRARA, PLATTE SUBBASIN			
Corn Creek	15,000	0	15,000
PLATTE RIVER SUBBASIN SUBTOTAL	15,000	0	15,000
NIOBRARA, PLATTE SUBBASIN[b] TOTAL	15,000	0	15,000
WYOMING TOTAL	205,470	52,391	257,798

[1]Source Documents:

[a]Missouri River Basin Commission, "Level B Study, Yellowstone River Basin and Adjacent Coal Area, Wind-Bighorn-Clark's Fork, Wyoming," Chapter V, April, 1978.

[b]Missouri Basin States Association, February 1982, Selected Missouri River Basin Water Use and Transer Proposals.

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
NORTH DAKOTA			
EASTERN DAKOTA TRIBUTARIES			
GARRISON DIVERSION UNIT			
Souris Loop	327,670	0	327,670
East Souris	151,950	0	151,950
Coleharbor	39,820	0	39,820
Harvey Pumping	10,310	0	10,310
New Rockford	67,190	0	67,190
Sykeston	37,000	0	37,000
Berlin	12,740	0	12,740
Harvey-Maddock	86,260	0	86,260
Warwick-McVille	41,380	0	41,380
Baldhill	96,810	0	96,810
LaMoure	12,200	0	12,200
Oakes	45,980	0	45,980
McClusky Canal	10,790	0	10,790
Velva Canal	5,000	0	5,000
GARRISON DIVERSION UNIT SUBTOTAL	945,100	0	945,100
NORTH DAKOTA PUMPING DIVISION			
Hanock Flats	3,600	0	3,600
Oliver-Sanger	8,000	0	8,000
Painted Woods	3,500	0	3,500
Little Heart	2,200	0	2,200
Horsehead Flats	10,500	0	10,500
Winona	4,000	0	4,000
Williston	3,135	0	3,135
Nesson	6,760	0	6,760
Manley	800	0	800
Wagonsport	1,200	0	1,200
Square Butte	1,770	0	1,770
Burnt Creek	700	0	700
Bismark	6,895	0	6,895
NORTH DAKOTA PUMPING DIVISION SUBTOTAL	53,060	0	53,060
PRIVATE PROJECTS SUBTOTAL	237,840	0	237,840

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
NORTH DAKOTA			
TOTAL	1,236,000	0	1,236,000
NORTH DAKOTA TOTAL	1,236,000	0	1,236,000

[1] Source Documents:

[a] U.S. Department of Interior, Bureau of Reclamation, November 1962, (Revised February 1965), Supplemental Report on Garrison Diversion Unit, Garrison Division - North Dakota, South Dakota, Missouri River Basin Project.

[b] U.S. Department of Interior, Bureau of Reclamation, December 1965, Report on North Dakota Pumping Division, Missouri River Basin Project.

See also Missouri River Basin Commission, March 1978, Yellowstone Basin and Adjacent Coal Area, Level B Study, Volume 1-8.

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
SOUTH DAKOTA			
EASTERN DAKOTA TRIBUTARIES			
STATE LINE TO OAHE			
Oakes Unit (Garrison)	62,020	0	62,020
Pollock-Herreid Unit	15,000	0	15,000
Mobridge Unit	1,600	0	1,600
STATE LINE TO OAHE SUBTOTAL	78,620	0	78,620
OAHE UNIT			
Missouri Slope	37,000	0	37,000
West Lake Plain	178,700	0	178,700
East Lake Plain	279,300	0	279,300
OAHE UNIT SUBTOTAL	495,000	0	495,000
OAHE TO GAVINS POINT			
Rousseau Unit	1,600	0	1,600
Joe Cr. Unit	4,400	0	4,400
Culdesac Unit	5,400	0	5,400
Ft. Thompson Unit	5,800	0	5,800
Wagner Unit	19,500	0	19,500
Tower Unit	1,400	0	1,400
Greenwood Unit	3,600	0	3,600
Tyndall Unit	153,000	0	153,000
OAHE TO GAVINS POINT SUBTOTAL	194,700	0	194,700
GAVINS POINT TO STATE LINE			
Yankton Unit	1,400	0	1,400
Missouri Terrace	45,000	0	45,000
Big Sioux Terrace	110,000	0	110,000
GAVINS POINT TO STATE LINE SUBTOTAL	156,400	0	156,400
EASTERN DAKOTA TRIBUTARIES TOTAL	924,720	0	924,720
SOUTH DAKOTA TOTAL	924,720	0	924,720

[1] U.S. Department of Interior, Bureau of Reclamation, November 1973, (Revised August 1975), Appraisal Report on Eastern South Dakota Basins, Pick-Sloan Missouri Basin Program, South Dakota.

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
NEBRASKA			
NIOBRARA, PLATTE & KANSAS SUBBASIN			
NIOBRARA RIVER BASIN			
Lavaca Flats	2,270	0	2,270
Mirage Flats	0	11,662	11,662
O'Neill Flats	77,000	0	77,000
NIOBRARA RIVER BASIN SUBTOTAL	79,270	11,662	90,932
PLATTE RIVER BASIN			
Nebr. Mid-State Division	140,000	0	140,000
Cedar Rapids Division	26,800	0	26,800
N. Loup Division	52,570	0	52,570
Highland Unit	55,000	0	55,000
Logan Unit	11,700	0	11,700
Norfolk Unit	33,000	0	33,000
Linwood Unit	10,600	0	10,600
Potential Irrigable[2]	2,274,398	0	2,274,398
PLATTE RIVER BASIN SUBTOTAL	2,604,068	0	2,604,068
KANSAS RIVER BASIN			
Little Blue River Unit	20,000	0	20,000
Big Blue River Unit	30,000	0	30,000
Potential Irrigable[2]	670,000	0	670,000
KANSAS RIVER BASIN SUBTOTAL	720,000	0	720,000
NIOBRARA, PLATTE & KANSAS SUBBASIN TOTAL	3,403,338	11,662	3,415,000
NEBRASKA TOTAL	3,403,338	11,662	3,415,000

[1]Source Documents:
Nebraska Natural Resources Commission, April 1973, State Water Plan Publication No. 301-1, Status Summary Potential Projects.

[2]The Missouri Basin Inter-Agency Committee, June 1969, The Missouri River Basin Comprehensive Framework Study, Appendix Volume 6, Land Resources Availability, Hydrologic Analysis and Projections.

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
COLORADO			
NIOBRARA, PLATTE, KANSAS RIVER SUBBASIN			
PLATTE RIVER BASIN			
Narrows Unit	0	287,000	287,000
PLATTE RIVER BASIN TOTAL	0	287,000	287,000
KANSAS RIVER BASIN			
Private Projects	125,000	0	125,000
KANSAS RIVER BASIN TOTAL	125,000	0	125,000
COLORADO TOTAL	125,000	287,000	412,000

[1] Source Documents:
U.S. Department of Interior, Water and Power Resources Service, 1981, Water and Power Resource Service Series: Colorado
Colorado Water Conservancy Board, January 1982, Telephone Conversation with Fred Daubert.

TABLE A-4. IRRIGATION PROJECTS IDENTIFIED IN CURRENT PLANNING DOCUMENTS[1] WITHIN THE MISSOURI RIVER BASIN (Continued)

Irrigation Project	New Land	Supplemental Water	Total Area
KANSAS			
KANSAS RIVER SUBBASIN TOTAL	1,198,000	0	1,198,000
MIDDLE MISSOURI TRIB. TOTAL	207,000	0	207,000
KANSAS TOTAL	1,405,000	0	1,405,000
IOWA (& MINNESOTA)			
MIDDLE MISSOURI TRIB. TOTAL	278,000	0	278,000
LOWER MISSOURI TRIB. TOTAL	690,000	0	690,000
IOWA (& MINNESOTA) TOTAL	968,000	0	968,000
MISSOURI			
LOWER MISSOURI TRIB. TOTAL	610,000	0	610,000
MISSOURI TOTAL	610,000	0	610,000

[1]Source Documents:
The Missouri Basin Inter-Agency Committee, June 1969, The Missouri River Basin Comprehensive Framework Study, Appendix Volume 6, Land Resources Availability, Hydrologic Analysis and Projections.

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